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OBSERVATIONS ON THE EPIDEMIOLOGY OF TSUTSUGAMUSHI DISEASE IN NORTH QUEENSLAND.

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TSUTSUGAMUSHI[1] DISEASE (scrub typhus, mite typhus, K typhus *et cetera*) has been recognized as such in North Queensland since 1935, principally owing to the work of Langan and Mathew[(1)] and of Unwin,[(2)] and to the later work of Mathew[(3)] and Heaslip,[(4)] although its identity had been suspected for a number of years earlier.[2] Its geographical limits are now recognized as extending from Cooktown in the north to Ingham in the south, and the adjacent parts of the Atherton Tableland. During the recent war this area of North Queensland was used extensively for the training of Australian troops in jungle and amphibious warfare. As a result of these training exercises many cases of typhus occurred, mainly of tsutsugamushi disease, with generally a low mortality. In the later stages of the war the number of cases occurring in North Queensland was reduced by (i) the introduction of an efficient mite-repellent following the excellent work of McCulloch, whose results have recently been published,[(5)] and (ii) the avoidance of an area for training purposes once it had been established as a focus for tsutsugamushi disease.

Prior to the recent war, work on localization of endemic foci for the disease in North Queensland was done by Mathew[(3)] and Heaslip.[(4)] Mathew stated that "in the Cairns area there are at least four clearly defined areas which may be considered as foci . . . namely, West Cairns and Edge Hill, Edmonton and Hambledon, Intake and Redlynch, Double Island and Yorkey's Knob". Heaslip listed the area from which he believed the infection had been contracted for each of his 54 cases. Heaslip himself listed six cases of his series as "doubtful tsutsugamushi". At the present time it is generally accepted that for a diagnosis of tsutsugamushi to be made either of two serological criteria should be fulfilled, these being (i) that the titre against *Bacillus proteus* OXK should be 1 in 160, or (ii) that if the titre is lower than 1 in 160 it should rise during the course of the disease. Nine of the series of 54 cases do not fulfil either of these two criteria, including two of the six cases listed as "doubtful" by Heaslip. These results are perhaps explicable by the fact that Heaslip may have been dealing with other forms of typhus, as well as with tsutsugamushi. It has only recently been shown by Andrew, Bonnin and Williams[(6)] that the endemic typhus of North Queensland includes forms in which a positive reaction to the Weil-Felix test is obtained with *Bacillus proteus* OX19 and *Bacillus proteus* OX2, and named by them tentatively "North Queensland tick typhus". They found in these cases titres against *Bacillus proteus* OXK as high as 1 in 80, and it is possible that Heaslip's series included some of these. Heaslip estimated the agglutination titres against *Bacillus proteus* OX19 as well as against *Bacillus proteus* OXK, only two of these (OX19) being significant. Later in this paper is described a case referred to as "North Queensland tick typhus", the infection being contracted near Trinity Beach in coastal North Queensland. It is also possible that Heaslip's series may have included some cases of infection by *Spirillum* or *Leptospira*; although in fairness it must be added that Heaslip was well aware of this possibility. The work of both Mathew and Heaslip was hampered by the paucity of information available on the incubation period of the disease, especially in these areas, it being difficult to establish in a civilian population.

[1] The use of this name is becoming general. The Japanese name undoubtedly has priority, and as a result of the work of recent years the various forms of scrub and bush typhus in which the Kingsbury strain of *Bacillus proteus* is agglutinated are becoming generally accepted as but variants of the one disease.

[2] See Blake *et alii*[(7)] for an excellent historical summary.

Cook[7] has recently published some valuable information on the localization of foci of the disease in North Queensland and New Guinea, following his investigations on outbreaks in Australian military personnel. Military censorship was still in force at the time his article was published (November 18, 1944); but it may now be stated that his "Outbreak A" was on Severin Creek, near Kairi, on the Atherton Tableland, that his "Outbreak B" was at Dead Man's Gully, near Palm Beach, north of Cairns, and that "Outbreak C" was in the vicinity of Dumpu in the Ramu Valley in New Guinea; the outbreak in the Ramu Valley has since been discussed by McCulloch.[8] (I am indebted to Dr. Cook for permission to publish this information regarding localities.)

The Object and Scope of the Present Work.

Whilst acting as deputy assistant director of hygiene on the headquarters of an Australian military division, located near Wondecla, on the Atherton Tableland of North Queensland, I was given permission to investigate the epidemiology of locally contracted typhus as part of my official duties. All cases of typhus contracted within the division were promptly notified by the three medical units (two Australian general hospitals and one Australian casualty clearing station) then functioning on the Atherton Tableland. Although only one major outbreak and a small number of "sporadic" cases were investigated over a period of three months, detailed investigations revealed a considerable amount of valuable information. The cases investigated were as follows: (i) the Bramston Beach outbreak of tsutsugamushi, of 70 to 75 cases, 34 subjects being available for detailed investigation; information from these cases was obtained about the natural localization of the disease and the incubation period; (ii) two cases of tsutsugamushi disease contracted near Trinity Beach and Palm Beach, north of Cairns, and one case of presumed tick typhus from the same general region; (iii) one case of tsutsugamushi disease contracted in the Wondecla-Minbun region of the Atherton Tableland, at the edge of the rain forest, and one case of murine typhus contracted from a camp site at Wondecla.

The medical units mentioned were responsible for the diagnosis in every case. The serological criterion required for the diagnosis of tsutsugamushi disease was that the agglutination titre against *Bacillus proteus* OXK should be 1 in 160 or higher.

It was decided to investigate each case as fully as possible. Each patient was visited in hospital and asked about his movements in the previous three weeks and earlier—the time spent in and out of camp, military exercises in which he had participated, careful note being taken of times and locations, the nature of duties on each exercise, to what extent he had been exposed at the various places (for example, by removal of clothing for sleeping), and to what extent he had been protected by mite-repellents on the exercise, whether any scrub itch or insect biting occurred on each exercise, the earliest onset of the prodromata, *et cetera*. Frequently the soldier was doubtful about dates; and his unit was always visited and as many statements as possible were verified. The dates were checked against the roll-book and further information and verifications were given (on at least one occasion dogmatic incorrect statements by the patient were thus corrected). Other questions would present themselves, depending on circumstances. An example of the *questionnaire* followed will be seen in the subsequent account of the Bramston Beach outbreak.

The possibility of having accurate cross-checks on dates puts the military epidemiologist in a more fortunate position than his civilian colleague, who generally has to rely entirely on the patient's statements. Thus it was possible to make accurate estimates of incubation times.

Under the conditions of these military exercises troops usually entered jungle for comparatively short periods of a few days or less, and this helped considerably in assessing the incubation times of disease thus contracted. Again, troops were frequently hampered by heavy gear, and in addition were frequently confined to limited localities, under orders to move; all these factors limited the numbers of possible places of exposure to the mite vector.

Studies were planned and attempted as follows: (i) investigations of the parasitization of mammals, birds and reptiles (lizards) with larval Trombidiid mites and the collecting of these for later identification; (ii) Weil-Felix tests on such of the above-mentioned vertebrates as were available—amounting to estimations on a series of birds and one reptile, from areas then believed to be typhus free; (iii) observations on Trombidiid mites free in nature and the collecting of these for subsequent identification (this work is still incomplete); (iv) inquiries into the cause of breakdown of antityphus measures, with particular reference to the efficacy of the mite-repellents used.

The Incubation Period.

Previously little information has been available with regard to the length of the incubation period in tsutsugamushi disease. Strong[9] refers to Oda's (Japanese) "series of 14 cases whose contacts could be definitely traced, the incubation period varied from 7 to 12 days, was frequently 8 days, and averaged 9 days from the time of the bite to the onset of general symptoms". Since the original article is not available it is not possible to discuss these results. Heaslip[4] was able to give a small amount of information about the incubation period in the Cairns area, four cases being reported by him as with the following incubation periods: (i) not more than ten days, (ii) between eleven and fifteen days, (iii) ten days, with reexposure from the sixth to the third day before the onset (this reexposure may be disregarded; this was a fatal case in which the agglutination titre against *Bacillus proteus* OXK did not rise above 1 in 40), (iv) twelve or more days.

Cook was the first to suggest that the principal incubation period for tsutsugamushi disease in North Queensland was twelve days, following his investigation of an outbreak of 37 cases from Dead Man's Gully, near Palm Beach, north of Cairns. I was able to confirm Cook's figure as fairly accurate, from an investigation of 34 cases of the Bramston Beach outbreak (*quod vide*).

The Bramston Beach Outbreak of Tsutsugamushi Disease.

Bramston Beach was selected for a large-scale amphibious exercise in February, 1944. Approximately 3,000 troops poured into this area and remained in the great majority of cases for twenty-four to thirty-six hours, being all that time in close contact with the scrub, and then left by land or sea for camps elsewhere. Approximately ten days after the exercise was completed cases of tsutsugamushi disease began to appear, the numbers increasing rapidly for a few days, and after several more days ceased (the occurrence of cases naturally does not correspond with the times of first diagnosis and notification). I conducted an investigation of the 34 cases which occurred in an Australian infantry brigade (Units A, B and C); a slightly greater number occurred in Unit D, which accompanied the brigade on the exercise, but unfortunately these patients were not available for detailed investigation. Thus there was a total of 70 to 75 cases, of which only one was fatal. The different military units had different incidences of the disease, and it soon became clear after inquiries had been made into the efficiency of the antityphus procedures within the units, that these differing incidences were principally due to differences in exposure to foci of the disease.

A detailed inquiry was made into the movements of each military unit and into the precise movements on the exercise of each soldier who had contracted tsutsugamushi. Since this outbreak, which followed a short-time exposure of a large number of men in an endemic area, is believed to be practically unique in the conditions it offered for epidemiological study, and as a similar outbreak is unlikely to occur except under military conditions, it has been decided to record the main features of the exercise in some detail, particularly as the results need a certain amount of interpretation.

Physical Features of the Bramston Beach Area.

Bramston Beach (Figure I) is in its natural features a typical sandy North Queensland beach, just over five miles

long, on the Pacific Ocean. Its mid-point is 14 miles north of Innisfail, and at longitude 146° 01′ east, latitude 17° 20′ south; the beach runs in a north-north-west and south-south-east direction. Inland from the beach in its northernmost four miles is a belt of fairly open timber, less than half a mile across; this belt is limited on its inland side by the extensive Wyvuri Swamp. Inland to the remaining southernmost mile of the beach there is dense rain forest ("jungle"), which runs down from the flanks of Mount Peter (height 950 feet) in the Graham Range. A road

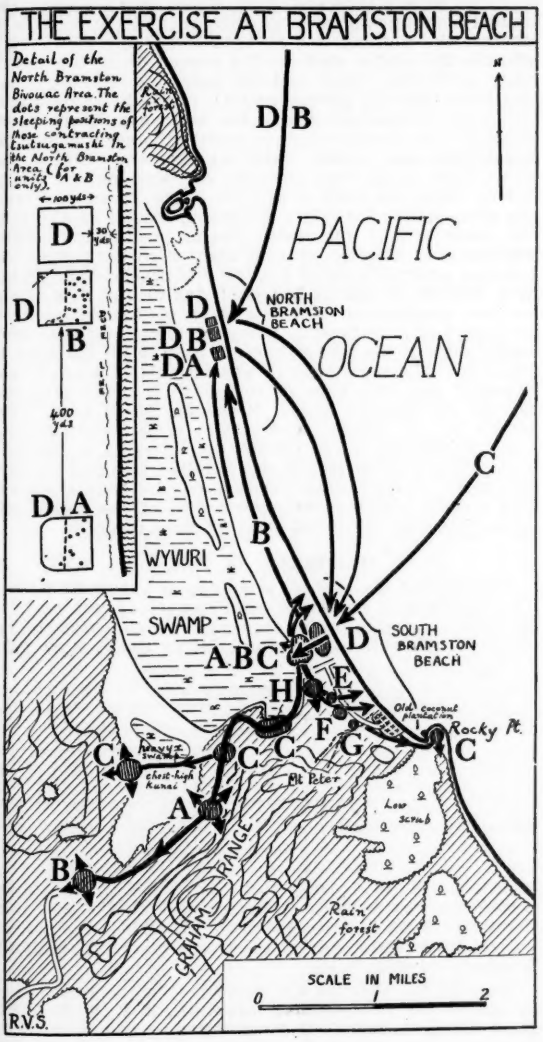

FIGURE I.

runs along the northern side of Mount Peter and skirts Wyvuri Swamp down to the beach; a small branch road runs off south from this main road, just before the beach is reached, for about a mile, to an old coconut plantation near Rocky Point. Inland to the southernmost two miles of Bramston Beach the terrain is dissected by numerous small creeks.

The map (Figure I) shows areas used as a bivouac at the northern end of Bramston Beach; these areas will be referred to subsequently as "North Bramston", and the term "South Bramston" will be used to include the southernmost two miles of the beach and the area inland to it.

The Exercise at Bramston Beach.

The 3,000 troops participating in the exercise at Bramston Beach consisted of four major units (A, B, C and D), basically Australian infantry battalions, and of a numerical strength of 700 to 900 men, together with a number of lesser sub-units of a numerical strength varying from 10 to 40 men; only four of these sub-units (E, F, G and H) are of importance from an epidemiological viewpoint. It is unnecessary and practically impossible to record all the minor movements that take place on an exercise, and in the following account the detail will be taken as far as considered necessary. The accompanying maps (Figures I and II) show the movements recorded in the text. In the making of the record representatives of the various sections of units were interviewed, and the operational orders were compared with the results achieved; it may be remarked here that the two sometimes differed.

Prior to the exercise, Units A, B, C, E, F, G and H on February 14, 1944, came down from camps free from

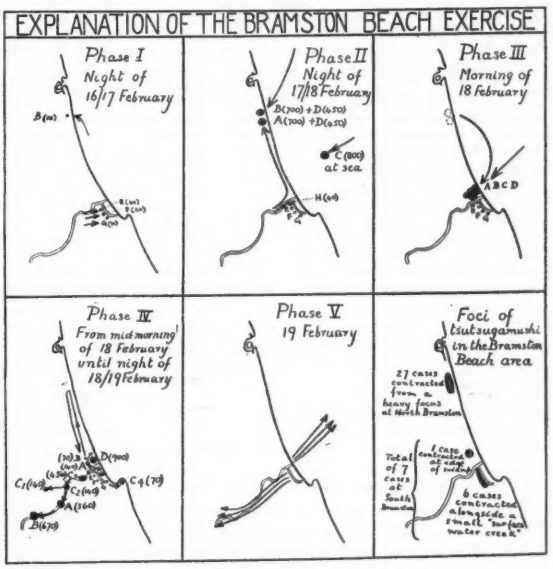
EXPLANATION OF THE BRAMSTON BEACH EXERCISE
Phase I
Night of 16/17 February
Phase II
Night of 17/18 February
Phase III
Morning of 18 February
Phase IV
From mid-morning of 18 February until night of 18/19 February
Phase V
19 February
Foci of tsutsugamushi in the Bramston Beach area
27 cases contracted from a heavy focus at North Bramston
Total of 7 cases at South Bramston
1 case contracted at edge of swamp
6 cases contracted alongside a small "surface water creek"

FIGURE II.

tsutsugamushi at Wondecla on the Atherton Tableland, to be quartered at Trinity Beach, north of Cairns, in a camp from which no typhus had been contracted (marked as "camp site considered free from the disease" in Figure V). Unit D was normally quartered near Palm Beach, north of Trinity Beach, again in a camp from which no typhus had been contracted.

The exercise at Bramston Beach, for convenience of discussion, has been divided into five phases as follows (see Figure II).

Phase I: *February* 15 *until Night of February* 16, 1944.—(i) Ten men from Unit B moved to the North Bramston bivouac area on February 16. These men were at North Bramston for two nights, and then at South Bramston, just behind the dune-line, near Unit E, for one night. One of these men contracted tsutsugamushi (Case XV). (ii) Unit E, of 40 men, after leaving Trinity Beach camp, moved to South Bramston and was there from February 16 to 19. One of these men contracted tsutsugamushi (Case XXXIII). (iii) Unit F, of 20 men, moved direct from Wondecla on the Atherton Tableland to South Bramston Beach, being there from February 15 to 19, when they returned direct to Wondecla. One of these men contracted tsutsugamushi (Case XXIV). (iv) Unit G, of 10 men, moved direct from Wondecla to South Bramston Beach, being there from February 16 to 19. These men were confined to one locality there. Two of these men contracted tsutsugamushi (Cases VII and VIII).

Phase II: *February* 17, 1944.—(i) Unit A of 700 men arrived in the afternoon by road, marching the last two miles from the road end at South Bramston to the North Bramston bivouac area. No time was spent at South Bramston. (ii) The main body of Unit B, 700 men, arrived by sea at North Bramston before sunset, to stay at the North Bramston bivouac area. (iii) Unit D, of 900 men, arrived at North Bramston, half of them having moved in conjunction with Unit A and the other half with Unit B. (iv) Unit H, of 40 men, arrived from Trinity Beach by road to stay at the road end at South Bramston Beach for the remainder of the exercise. None of these men contracted tsutsugamushi, but two men with the disease (Cases XVIII and XXV) staying in the same area are considered to have contracted it there.

Phase III: *February* 18, 1944; *Morning*.—(i) All of A, B and D moved by sea from North Bramston to South Bramston. Unit D remained in this new position, just inland to the beach, for the remainder of the exercise. (ii) Unit C, of 800 men, landed at South Bramston from the sea, and grouped with Units A and B, just inland to Unit D. Units A, B and C stayed in this position for only three or three and a half hours.

Phase IV: *February* 18, 1944; *Mid-Morning and Remainder of Day*.—(i) Six hundred and seventy men of Unit B moved inland to the position shown, and spent the night there. The other 30 men of Unit B left the main body and patrolled northwards, inland to the beach, during the night, going as far north as the North Bramston bivouac area. (ii) Five hundred and sixty men of Unit A moved inland along the road, but not as far as Unit B. The other 140 men of Unit A remained in their Phase III position, but patrolled round the edges of Unit D during the night. (iii) Unit C divided into sub-units, as follows: (*a*) Unit C1 (140 men), after moving along the road, branched off to the right, pushed through heavy swamp and kunai to remain the night at the jungle edge; (*b*) Unit C2 (140 men) remained alongside the road where Unit C1 branched off and spent the night there; (*c*) Unit C3 (450 men) moved a short way along the road; (*d*) Unit C4 (70 men) moved to the high ground at Rocky Point on the coast and spent the night there.

Phase V: *February* 19, 1944.—All units withdrew from their inland positions and reconcentrated on the beach at South Bramston early in the morning. During the morning all troops left by motor vehicle or by ship, Units A, B, C and H to return to the Trinity Beach camp site to spend either one or two nights there before returning to Wondecla, Unit D to return to its camp site at Palm Beach, and Units E, F and G to return direct to Wondecla.

Precautions against Mite-Borne Typhus.

Instructions as given in the appendix of McCulloch's article[5] had been promulgated prior to the exercise. However, the importance of these had not been fully realized by many of the officers and men, although the majority of troops on the exercise had had some repellent (dibutyl phthalate or alternatively dimethyl phthalate) applied to their clothing. The two most important exceptions were Units H and E, which did not use dibutyl phthalate at any time before or during the exercise, although dimethyl phthalate was applied to the exposed skin of the face and hands as a mosquito repellent, and no doubt a certain amount of this soiled parts of the clothing. Instructions were also in existence that troops would not remove any part of their clothing, including boots, socks and gaiters, to sleep; but these instructions were frequently disregarded on account of their unpleasantness in a tropical climate.

The Investigation.

Each man suffering from tsutsugamushi disease was interrogated in hospital, with the exception of one very sick patient who subsequently died. The following series of details was sought from each patient: (i) name, rank and number; (ii) unit (battalion *et cetera*), company, platoon, section; (iii) craft number, where movement by sea was by landing craft (this refers to the precise sleeping position in the North Bramston bivouac area, these positions being allotted for ease of embarkation in the craft); (iv) whether the soldier was in the Trinity Beach area, and what his duties were there; (v) the same information for North Bramston; (vi) the same information for South Bramston, in the coastal part; (vii) the same information for South Bramston, inland; (viii) whether mite-repellent (dibutyl phthalate, or "Betty") was applied to the clothing, whether all clothing was treated, whether the repellent was applied by hand, spray or other means; (ix) whether dimethyl phthalate ("Mary") was used as a substitute for dibutyl phthalate; (x) whether, in the opinion of the soldier, the repellent was applied efficiently, so as to give overall cover; whether it was applied to the inside, outside or both sides of the clothing; (xi) whether the repellent was applied before the soldier moved to Trinity Beach; (xii) whether it was applied before the soldier moved to Bramston Beach; (xiii) whether it was reapplied at any time and, if so, when; (xiv) whether the treated clothing was worn on each part of the exercise or whether the clothing was changed before any move; (xv) whether the soldier slept on the ground or off the ground when at Trinity Beach, and the nature of the bed, if one was used (all had groundsheets); (xvi) the same details for North Bramston; (xvii) the same details for South Bramston, in its coastal part; (xviii) the same details for South Bramston, inland; (xix) whether any clothing, and if so, how much, was removed for sleeping at Trinity Beach; (xx) the same details for North Bramston; (xxi) the same details for South Bramston, coastal area; (xxii) the same details for South Bramston, inland; (xxiii) whether any pimples or skin rash were noticed on the exercise, and particularly whether any previous pimple had been noticed on the eschar site; (xxiv) the date of the earliest prodromata, and the date of evacuation to a medical unit. Naturally, many of these questions were inapplicable if the soldier had not been in all the areas in question. The *questionnaire* was formulated when it was apparent that the bulk of the patients must have contracted the disease in the Bramston Beach area. The replies of the soldier, which were sometimes indefinite, were checked as far as possible by reference to his unit. The presence of an eschar was inquired into and a record was made of its precise position on the body when one was present. A note was made also of the man's hair colour and any additional remarks were recorded.

Localization of Foci.

The onset of the earliest symptoms is shown in Table I. The incidence of new cases on February 29 was striking. Major Cook had already suggested, on the basis of his work on the outbreak at Dead Man's Gully, near Palm Beach, north of Cairns, that the principal incubation period was twelve days. Counting back twelve days from February 29 takes us to February 17, which was the day on which the main body of the troops moved to the North Bramston bivouac area.

TABLE I.

	February.			March.					
	27	28	29	1	2	3	4	5	6
Number of daily new cases..	1	2	17	6	2	2	1	2	1

Prior to the exercise the personnel had been quartered in camps free from tsutsugamushi—A, B, C, E, F, G and H at Wondecla and D at Palm Beach.

In the series of 34 cases we have the following data:

Never at Trinity Beach .. .. 5 patients
Never at North Bramston .. .. 6 patients
Never at South Bramston .. .. 2 patients
Never inland at South Bramston .. .. 13 patients

Every patient in the whole series of 34 cases was at some time at North or South Bramston, and 26 patients were at both these situations.

The incidence of cases by units is shown in Table II.

When at Trinity Beach, Unit C used the same camp site as Units A and B, in fact even changing over areas within the camp site with them. As will be shown later, the discipline with which the repellent was applied in Unit C was laxer than in Units A and B; yet Unit C had not a

single case of tsutsugamushi. The camp site at Trinity Beach had been in extensive use prior to this particular exercise, without cases of tsutsugamushi disease having been contracted from it. By its continual use the camp site had been largely denuded of vegetation, and the weather while Units A, B and C were there was mostly cool and rainy. The fact that five patients out of the 34 were never at Trinity Beach certainly points against this camp site as being a major focus of the disease, and after a consideration of the other points enumerated, particularly the complete freedom of Unit C from the disease, and the remainder of the exercise, we may exclude this camp site from any responsibility in the outbreak.

TABLE II.

	Unit.							
	A.	B.	C.	E.	F.	G.	H.	Others.
Number of cases ..	9[1]	19	0	1	1	2	0	2[2]

[1] Includes Case IX, infection contracted at South Bramston.
[2] Cases XVIII and XXV; both infections contracted at South Bramston see later in text).

The coastal part of South Bramston may readily be indicted by the fact that two patients (Case VIII of Unit G and Case XXIV of Unit F) spent the whole of their time on the exercise in a restricted area at South Bramston Beach. Two further patients (Case VII of Unit G and Case XXXIII of Unit E) spent practically the whole of their time at the same area, and may with confidence be referred there for the contraction of the disease, particularly as one of them (Case VII) removed his clothing and washed at the same creek every day with Case VIII. These two patients (Cases VII and VIII, both belonging to Unit G) slept well off the ground at night, and it is considered that both of them contracted the disease alongside this small "surface water creek", located about a hundred yards north of the coconut plantation shown in Figure I. Nine or ten personnel (Unit G) washed every afternoon at this creek for three successive days; that is, two cases of the disease were probably contracted from 27 to 30 washes. None of these four patients (Cases VII, VIII, XXIV, XXXIII) was at Trinity Beach or North Bramston. A further two patients (Cases XVIII and XXV), who were never at North Bramston but were at both Trinity Beach and South Bramston, are referred for the contraction of the disease to a northwards extension of the same area. On the night of February 17 both slept in the Unit H area at South Bramston and on the following night both slept inland at South Bramston, one patient (Case XVIII) with the main body of Unit B and the other (Case XXV) with Unit C3, and thereafter remained with those units. Both of these men slept naked at night throughout the exercise, and ample opportunities for infection can be conceived. Both are considered to have contracted the infection in the Unit H area. Case IX is also referred to the South Bramston coastal area.

The patient was a sergeant belonging to Unit A, and he moved with that unit throughout the exercise. His clothing had been sprayed on the inside with dibutyl phthalate before he left Trinity Beach, and when at Bramston he wore all his clothing, including boots, at all times (including the night), except on one occasion, when he removed all his clothing in order to wash himself at the swamp edge somewhat north of the road (see Figure II). On the exercise he wore American pattern gaiters which press the trousers tightly against the legs; this close investment of the lower parts of the legs by treated clothing would have given excellent protection against the mite vectors of tsutsugamushi disease. He developed the prodromal symptoms eleven days after this wash. An eschar was present on the side of the left knee. At the Trinity Beach camp site he slept on a ground-sheet on the ground, wearing little clothing, on the nights of February 14, 15 and 16.

It is unlikely, for the reasons given above, that this patient contracted the disease at Trinity, and as he was exposed only once when at Bramston, it is reasonable to assume that he contracted the disease on that occasion, particularly as the eschar was in a site which, with the use of repellent, would normally be well protected.

It is not possible to incriminate North Bramston as directly as we can South Bramston. However, four patients (Cases III, XIX, XXVII, XXXI) were overnight at North Bramston and then at South Bramston for only a few hours on the following morning, and while at South Bramston did not expose themselves to infection by the removal of clothing; hence we may deduce (having excluded Trinity Beach) that their infection was contracted at North Bramston. Excluding the seven cases which we have referred above to South Bramston, there remain 27 cases out of the 34 in which the locality of contraction of the infection needs to be determined. The single postulate that the North Bramston bivouac area was infected allows us to account for all these 27 cases. If we do not accept this explanation the following alternative postulates must be made: (i) the disease was contracted at the landing area at South Bramston or (ii) the infections were contracted inland at South Bramston, from multiple foci. With regard to postulate (i), Units A, B and C were all in this area for approximately equal times, under similar conditions, except that there was a higher frequency of failure to use mite-repellent in Unit C; yet Units A and B contracted the disease and Unit C escaped completely. With regard to postulate (ii), Units A and B and the sub-units of Unit C were widely separated when inland at South Bramston, in terrain not essentially dissimilar, except for Sub-Unit C4 at Rocky Point. This postulate then requires that Units A and B both found foci, and that Sub-Units C1, C2 and C3 failed to do so; thus postulate (ii) is not really a single postulate but a set of five separate postulates. One may therefore discount both of the possible alternatives that deserve consideration and accept that there was a heavy focus of tsutsugamushi in the North Bramston area.

Summarizing, we may state that at Bramston there are three areas from which tsutsugamushi disease has been contracted. These are shown in Figure II. This does not necessarily mean that these are the only foci at Bramston Beach. There remain large parts of the coastal and other areas of Bramston Beach that were occupied little or not at all by troops, and it is not possible to state how far the infected area extends southwards from the North Bramston bivouac area. The fact that Unit B had a higher incidence of the disease than Unit A (approximately double), despite the fact that the antityphus discipline in Unit B appeared to be a little better than that in Unit A, may not be without its significance. Unit B was closer to the stream flowing into the small inlet that limits Bramston Beach at its northern end. Cook[7] and the earlier Japanese authors have laid stress on the relationship of tsutsugamushi disease and water courses.

The Incubation Period of Tsutsugamushi Disease at Bramston.

After the principal foci were decided on, each case was carefully reconsidered in an attempt to find an incubation time for each. In this assessment the greatest weight was given to the amount of exposure in the infected area by removal of clothing and by lack of use of repellent. It is considered likely that many of the infections—for example, at North Bramston—were contracted in the evening and night, as then most clothing was removed and troops were in greatest contact with the soil. It is believed that the evening drop of temperature, with its consequent diminution of activity of the infected mites, could have been compensated for by the heat of the soldier's body warming the micro-climate of the mite. Major McCulloch has informed me that he made a few observations on the nocturnal activity of larval Trombiculid mites in New Guinea and found them as active by night as by day, provided that the temperature remained above the limit stated by him (65° F. for practical purposes). There were 29 cases in the series of 34 in which the contraction of the disease could be allotted to a single day. The incubation periods varied between 11 and 18 days. The details of the incuba-

tion periods were as follows: 11 days (3 cases), 11 to 12 days (2 cases), 12 days (14 cases), 12 to 13 days (1 case), 13 days (6 cases), 14 days (1 case), 13 to 16 days (1 case), 15 days (1 case), 16 days (1 case), 16 to 18 days (1 case), 17 days (2 cases), 18 days (1 case). By allotting those infections that could have been contracted on more than one day to the mean of the limits stated Table III and the histogram (Figure III) were constructed.

The mean of these figures is 13·06 days, with a standard deviation of 1·89 days.

Frequency and Distribution of Eschars.

Of the 34 patients, six had no eschar, twenty-five had one eschar, two had two eschars, none had three eschars,

TABLE III.

Incubation Period in Days.	Number of Cases.
10	0
11	4
12	15
13	7
14	1
15	2
16	1
17	3
18	1

and one had four eschars. The distribution of the eschars on the body is shown in Figure IV and analysed in Table IV. A comparison of this figure with that of Blake *et alii*,[8] from an outbreak amongst American troops in the Dobadura area of New Guinea, shows that in the Bramston series there was a rather higher proportion of eschars in the pubic region.

Particular inquiry was made with regard to any evidence of mite-biting on the exercise, but none was found. In the series of 34 patients not one had noticed any previous pimple on the site of the eschar. Only two patients had had any skin complaints on the exercise. One patient (Case XXV) stated that he had had a rash on his calves

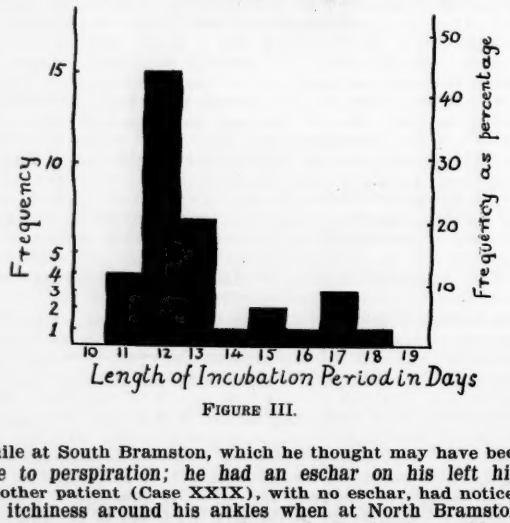

FIGURE III.

while at South Bramston, which he thought may have been due to perspiration; he had an eschar on his left hip. Another patient (Case XXIX), with no eschar, had noticed an itchiness around his ankles when at North Bramston, of which the cause was unknown. No further evidence relating remotely to mite-biting was found. No complaint of "scrub itch" was made. The freedom from obvious bites may have been due to the use of repellent; but not all personnel were thus protected on the exercise. An early appearance of an eschar seems to have occurred in Case IX; this patient stated that a sore appeared on his leg four or five days after he had left Bramston; this sore was subsequently identified as an eschar (this was the infection contracted at the swamp edge).

The lack of a previous pimple on the eschar site has been remarked on by previous authors, and it was one of the facts which caused Cook[7] to suggest larval ticks rather than mites as the vectors of the disease. It may be remarked here that the common scrub itch mite of New Guinea (*Schöngastia blestowei*) is not the species that carries tsutsugamushi disease (*Trombicula fletcheri*).[5][9]

Protection by Repellents.

Of the 34 patients investigated, only nine had not used dibutyl phthalate; but five of these had used dimethyl phthalate as an alternative for overall cover. Thus only four out of the series of 34 had completely unprotected clothing on the exercise; one man of these four (Case

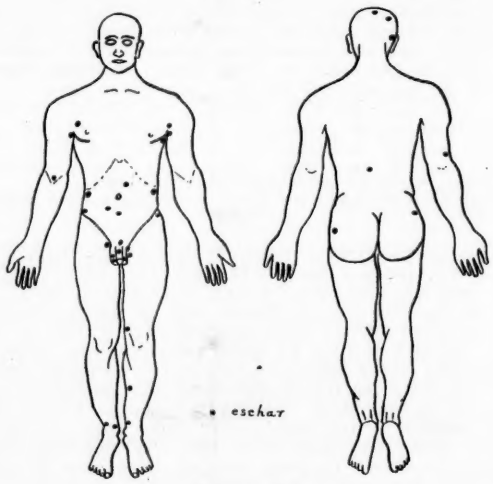

FIGURE IV.

XIX) had treated one set of clothes, but changed into an untreated set before moving to Bramston Beach, under the impression that the protection was required for the Trinity Beach area. However, the breakdown of protection in 30 of the 34 cases was explicable immediately either by failure to use repellent or by complete or partial removal of clothing (mostly at night) over the area in which the eschar was sited. Of the remaining four patients, three slept partially exposed by removal of clothing, although the eschar site does not correspond to the regions exposed. The remaining case is the only one of the 34 in which all precautions were taken and tsutsugamushi disease was contracted.

Throughout Units A, B and C approximately three-quarters of the personnel had applied the repellent to their clothing by spraying it with a fly-spray, and most of the remainder had applied the repellent by the official hand-application method or some variation of it. In Units A and B there were few personnel who did not apply the repellent; but in Unit C the supervision was much laxer and a considerable number of soldiers did not apply any repellent to their clothing. (I am indebted to Captain J. M. Lister, the regimental medical officer of this battalion, who conducted an interrogation of a random sample of 39 subjects in Unit C and found that five had applied no repellent to their clothing and that the supervision was lax.) Despite the failure to use the official method of application in the majority of the three major units investigated, there was no evidence to suggest that the spray method resulted in a failure of protection. The shortness and the strenuous nature of the exercise meant that for practical purposes there was no washing of clothing, with a consequent diminution of its miticidal powers; breakdowns could be expected early if a low initial dosage of repellent was used. I have had the opportunity of discussing this with Major McCulloch, who considers that adequate protection was afforded on the exercise, despite

the smaller dosage given by the spraying method of application. A small amount of additional protection could have been given by the use of dimethyl phthalate as a mosquito repellent, although this, by being applied mostly to exposed skin, would have given at best only partial and haphazard protection.

Repellents and Eschar Siting.

Table IV analyses the eschar siting in the Bramston series of cases of tsutsugamushi disease, and the correspondence or otherwise of the sites with either lack of usage of repellent (as an overall cover) or the removal of clothing from that region of the body.

TABLE IV.

Site.	Number of Eschars.	Directly Explicable by Exposure or by Lack of Repellent when in a *Focus of* Tsutsugamushi.	Equivocal.[1]	Not Readily Explicable.[1]
Head	3	3	0	0
Axilla	5	2	0	3
Upper part of arm	2	1	1	0
Front of trunk and flanks	5	5	0	0
Back of trunk ..	1	1	0	0
Pubes and perineum	8	6	2	0
Hip	4	3	0	1
Upper part of leg ..	1	1	0	0
Lower part of leg ..	1	1	0	0
Ankle and foot	3	3	0	0
Total	33	26	3	4

[1] The terms "equivocal" and "not readily explicable" are used here in a severe sense. For example, a case in which a subject who had a shirt treated with repellent and yet developed an axillary eschar is considered as "not readily explicable", even though it is not hard to imagine a mite gaining access when a man was sleeping on the ground, and surviving long enough to traverse the area from the neck opening of a shirt to the axilla, and then lodging between axillary folds of skin, where it would be able to recover from the effects of the repellent. The term "equivocal" is used to signify a case in which a subject had some part of the body exposed, and an eschar in a part of the body covered by treated clothing.

Thus out of a total of 33 eschars 26 were explicable readily by a failure of the patient to maintain a layer of cloth treated with repellent over the region of the body in which the eschar occurred. This is a striking testimony to the protective powers of dibutyl phthalate (and dimethyl phthalate) and to the value of the research done by McCulloch.

All the six patients with no eschar were similarly exposed by lack of repellent *et cetera* in the regions considered as foci of tsutsugamushi disease, sufficiently to account for the contraction of the disease. The preference for the pubes and axillæ as eschar sites will be noticed from Table IV and figures. Possibly this may be accounted for by the fact that mites may lodge between layers of skin in apposition in these regions. Possibly in the case of the axillæ the incidence was due to the practice of sleeping with the shirt-front unbuttoned; but no inquiry was instituted into this. It is therefore suggested that particular attention should be paid to the buttoning up of the shirt for sleeping in endemic areas, and that particular attention should be paid to the treatment with repellent of the crutch and armpit parts of the clothing.

Other Points.

A record was made of the hair colour of each patient who contracted the disease, and although it was difficult to estimate quantitatively, it did not appear that the hair colour in the series differed significantly from the normal. The record was made since in my experience on the Atherton Tableland, red and fair haired people suffer more than others when in contact with mite-infested country, and from collections of mites made from soldiers it would appear that such persons are more frequently bitten than dark-haired individuals.

The Trinity and Palm Beach Foci.

That the Trinity and Palm Beach area contains foci of endemic typhus has been suggested by Mathew,[3] who ascribed four of his cases to this region. He refers to the "Double Island and Yorkey's Knob focus"; it is not recorded how precise his localizations were. The areas marked by Mathew are shown in Figure V. Cook[7] described an outbreak of 37 cases of tsutsugamushi disease, of which 28 were from one Australian infantry battalion, occurring in June and July, 1943, at Dead Man's Gully, near Palm Beach (this was his "Outbreak B"). Cook correlated the numbers of daily new cases with the 9 a.m. dry bulb temperature readings at Cairns twelve days before, and, finding a good correlation, was able to suggest that the principal incubation period for the disease was twelve days—knowing from McCulloch's work that the activity of Trombiculid mites ceases below 65° F. The precise area indicted by Cook was never subsequently used for exercises and bivouacking to any appreciable extent. There need be no question that this area (shown in Figure V) is an area of heavy endemicity.

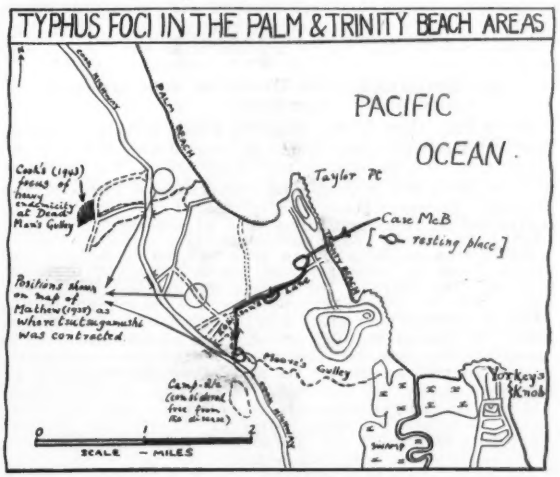
TYPHUS FOCI IN THE PALM & TRINITY BEACH AREAS
PACIFIC
OCEAN
PALM BEACH
Taylor Pt
Cape McB
[resting place]
Cook's (1943) focus of heavy endemicity at Dead Man's Gully
Positions shown on map of Mathew (1939) as where tsutsugamushi was contracted
Moore's Gulley
Yorkey's Knob
SCALE — MILES

FIGURE V.

No further major focus has since been discovered in the Palm Beach and Trinity Beach area. However, I have investigated three cases of endemic typhus (two of tsutsugamushi disease and one of North Queensland tick typhus).

CASE 1.—This was a case of tsutsugamushi. An infantryman, McB., moved from the Atherton Tableland (Wondecla) to Cairns by motor vehicle, and then went straight aboard ship, having no contact with any scrub. On February 24, 1944, he landed at Trinity Beach as shown in Figure V. When moving progressively inland up or alongside Robinson's Lane, he was stationary and in contact with scrub at three areas as shown, either sitting down or lying down on each occasion, the third of these halts being alongside a small creek flowing into Moore's Gully. After four or five hours in the Trinity Beach area he boarded a vehicle and returned to camp at Wondecla. He used no repellents of any type. The onset of symptoms of the disease was on March 7; thus there was an incubation period of twelve days.

CASE 2.—This was a case of tsutsugamushi. T.R.C., an infantryman, moved from his camp at Wondecla by motor vehicle to a camp site near Robinson's Lane on April 16, 1944. He was in contact with scrub near Robinson's Lane from April 17 to 20, and again in contact with scrub near the centre of the Palm Beach area on April 21, where he removed part of his clothing. On April 22 he returned to Wondecla. Prodromata developed on May 5, and subsequently an agglutination titre of 1 in 1,280 was obtained against *Bacillus proteus* OXK, and no agglutination occurred at a titre of 1 in 20 against *Bacillus proteus* OX19. An eschar developed on the outer aspect of his left thigh. His clothing had been treated with dimethyl phthalate as a mite

repellent, and the only possibility of exposure that he would admit was the removal of trousers at Palm Beach on April 21. Thus it is most likely that the tsutsugamushi was contracted at Palm Beach, the incubation period being fourteen days; there is a lesser possibility that it was contracted at Trinity Beach, which would require an incubation period of fifteen to eighteen days.

Case 3.—This was not a case of tsutsugamushi, but can be regarded as one of North Queensland tick typhus. This infantryman was at Trinity Beach (near Robinson's Lane) from March 14 to 16, 1944, in contact with scrub; after moving by sea he landed south of Port Douglas, and spent from March 17 to March 18 in contact with the scrub there. The onset of symptoms was on March 26. An agglutination titre of 1 in 640 developed against *Bacillus proteus* OX19, and a titre of 1 in 80 against *Bacillus proteus* OXK. The titre against *Bacillus proteus* OX2 was not estimated. An exanthem developed, and an eschar appeared in the right axilla. The condition was diagnosed as mild endemic typhus.

As an eschar is not present in murine typhus it is considered that the case should be regarded as one of North Queensland tick typhus. It is thought worthy of record here, as no case of this disease has previously been reported from this area. If it was contracted at Port Douglas, the incubation period would have been nine days, or if at Trinity Beach, ten to twelve days. It is not possible to determine which of these areas was responsible.

The Wondecla-Minbun Region of the Atherton Tableland.

For a long time it was believed that the rain forest of this region was free from tsutsugamushi disease, on account of the extensive use made of it for military training purposes without the occurrence of cases of the disease. However, one case of the disease undoubtedly contracted in this region has been discovered.

B.C.R. was an infantryman who had not been near any known focus of tsutsugamushi for a period of over six months. The onset of the disease was on March 12, 1944, with headache, followed by pyrexia, general lymphadenitis, and a Weil-Felix reaction of 1 in 160 against *Bacillus proteus* OXK. No eschar was discovered. The patient had been in camp at Wondecla for the whole of the previous month, except on two occasions: (i) from February 14 to 17 he participated in an exercise at Mount Fisher (near Chilverton); (ii) on February 29 he was in the rain forest at the beginning of some pathways through the "jungle" known as Seamark's and Turner's Tracks, being there for a period of about twenty-four hours; he moved about very little, having become separated from the rest of his company. Almost exactly twelve days after this second contact with the "jungle" edge the initial symptoms occurred.

No typhus had previously been ascribed to this area nor to the Mount Fisher area. If the Mount Fisher area had been responsible, then the incubation period would need to have been twenty-four to twenty-seven days. Although probably not impossible, this length of incubation period is extremely unlikely and for practical purposes may be disregarded. Thus one may state that the disease was contracted at the edge of the rain forest towards Minbun, at the track junctions mentioned, the incubation period being twelve days.

No case of typhus has previously been ascribed to the extensive camps at Wondecla. I have a record of a case of probable murine typhus, contracted from the camp area at Wondecla, which should be recorded to complete as far as possible the picture of endemic typhus in the Wondecla region. (Andrew *et alii* have ascribed cases of North Queensland tick typhus to this region.)

J.H.S. was an infantryman, who had not been near any known focus of typhus for several months. The onset of the disease was on May 13, 1944, with shivering, headache, backache and cough. He became pyrexial, and an erythematopapular rash developed. No eschar was seen and the spleen was not palpable. No lymph glands were palpable. On May 24 the results of the Weil-Felix test were as follows: against *Bacillus proteus* OXK, a titre of 1 in 40; against *Bacillus proteus* OX19, 1 in 160. Again, on May 30 the results were as follows: against *Bacillus proteus* OXK, 1 in 40; against *Bacillus proteus* OX19, 1 in 20,500. He was accordingly diagnosed as suffering from murine typhus.

There had been an epidemic of fleas in the camps, and the patient had been bitten. Prior to the onset of the disease he had been in camp at Wondecla for several weeks, except for a reconnaissance trip to Montalbion, near Irvinebank, in the drier part of the Atherton Tableland, from May 5 to 6. If the limits of the incubation period for the disease are assumed to be nine to eighteen days, he was in camp during that period of time previously, and the disease can therefore be considered to have been contracted there.

Relation between Tsutsugamushi Disease and Birds.

If one looks at the two maps of the geographical distribution of tsutsugamushi disease published recently,[5][18] one is struck by the fact that the disease is limited to the Orient, extending from India in the west to Japan in the north, through Malaya, the East Indies and the Philippine Islands to New Guinea and the Solomon Islands, and as far south as the coastal part of North Queensland. A possible explanation for this is that bird migration has been largely responsible. The suggestion that birds may play some significant part in the distribution of the disease was first made by the Japanese workers (see Walch[11]), who suggested several species as likely to be incriminated. Later Walch, working in Sumatra, similarly found larval Trombidiid mites on birds, and suggested several species of local birds as being concerned in the "somewhat fantastical spreading" of tsutsugamushi disease. As none of the species of birds suggested by the Japanese workers or by Walch has been recorded from Australia, it is likely that any spread by the agency of birds would tend to be a piecemeal affair. It is not necessary, in accounting for the geographical distribution of the disease, by our present belief that the rickettsia of the disease persists for more than one generation in the mite, that the birds themselves should be infected.

Although Hayashi claimed in 1925 to have propagated the disease through several generations of chickens, Blake *et alii*,[6] of the United States Typhus Commission, state that this has not been confirmed, and that "natural infection of any species of bird with the virus of tsutsugamushi disease has not been demonstrated".

The possibility that birds may be responsible for the anomalous distribution of another form of typhus—"Q" fever of southern Queensland, which appears to be identical with American "Q" fever—has been mentioned by Derrick,[12] on the basis of a specimen of the natural tick vector *Hæmophysalis humerosa* having been found on a migratory bird (*Eurystomus orientalis*—the dollar bird) at Maryborough, Queensland (Smith[14]). However, it appears from recent work that "Q" fever is also found in the Mediterranean region.

Investigations on Birds in North Queensland.

I had hoped to test the Weil-Felix reactions of a series of birds from a typhus-free area, and then of a similar series of birds from an endemic focus of tsutsugamushi disease. Military operations and regimental duties prevented this plan from being carried out, and all that was achieved was that a limited control series of birds was tested, at Wondecla, in April, May, June and August, 1944. These birds were from two differing natural habitats: (i) from dense sclerophyll forest just outside the edge of the rain forest ("jungle"); (ii) from open forest from drier country in the vicinity of Wondecla, and some from similar country near Kaban, eight miles from Wondecla. These birds were all from country believed to be typhus-free. Since then Andrew *et alii* have ascribed the contraction of tick-borne typhus in some cases to the neighbouring forest.

The birds were shot with a 0·22 calibre rifle, and immediately the heart was exposed and as much blood as possible was taken by cardiac puncture. In the majority of even the small birds enough serum for a Weil-Felix estimation was obtained. Two specimens of blood from birds, removed from the thoracic cavity, were heavily contaminated by gastric contents from the shooting and were tested as controls; the specimens after centrifugation were still badly hæmolysed. Both specimens gave agglutination at a titre of 1 in 320 for each of the three suspensions of *Bacillus proteus* (OXK, OX19 and OX2). One specimen was from a scaly-breasted lorikeet (*Trichoglossus*

chlorolepidotus) and the other was from a rainbow lorikeet (*Trichoglossus moluccanus*); both birds were shot in dense sclerophyll forest near Wondecla on June 18, 1944. Two other specimens of blood clotted; presumably these were contaminated also (bird's blood does not clot easily). The remainder of the results were considered satisfactory and are shown in Table V.

The only bird of the foregoing series that gave a positive Weil-Felix reaction against *Bacillus proteus* OXK, and therefore might have been naturally infected with tsutsugamushi disease, was the pied currawong listed in Table V. Occurring as it did in country believed free from tsutsugamushi disease, it was of considerable interest. On this bird were two parasites, larval Ixodid ticks, which it has not been possible to have identified up to the present. No other bird taken at Wondecla had any parasitic ticks or mites (except for the common Analgesid mites of birds, which are feather parasites only). The Weil-Felix estimations were repeated several times on the serum of this currawong, with identical results. The only cases of typhus contracted near this region were as follows: (i) one case of tsutsugamushi disease (B.C.R.) from the junction of Seamark's and Turner's Tracks, recorded above and approximately four miles away; (ii) five cases of tick-borne typhus referred to the rain forest of the Wondecla region by Andrew, Bonnin and Williams.[6] Otherwise the nearest foci, both of tsutsugamushi, were at Rocky Creek beyond Atherton and at Severin Creek beyond Kairi, both of these being about twenty miles away.

Savoor and Lewthwaite[15] have shown that in experimental rat-bite fever a high agglutination titre may be developed against *Bacillus proteus* OXK. They inoculated rats, rabbits, mice, guinea-pigs, monkeys and men with *Spirillum minus*. Absent or equivocal titres against *Bacillus proteus* OXK developed in the monkeys (*Macacus*) and men; high titres (up to 1 in 3,400) against *Bacillus proteus* OXK developed in the rabbits, but none gave any response against *Bacillus proteus* OX19; three white rats were tested and gave titres up to 1 in 110 against *Bacillus proteus* OXK, but no agglutination against *Bacillus proteus* OX19. In experimental infections with *Bacillus proteus* OXK in rabbits high agglutination titres against this organism were rapidly developed, the maximal titre recorded in rabbits being 1 in 2,000. The concomitant rise of titre, if any, against *Bacillus proteus* OX19 was not tested. Blake *et alii*[8] record maximum titres of 1 in 2,560 against *Bacillus proteus* OXK in the Dobadura series of cases of tsutsugamushi disease. They record that the results with *Bacillus proteus* OX2 were consistently negative; but with *Bacillus proteus* OX19 many patients showed agglutinins at titres of 1 in 20 to 1 in 160. I can find no data relating to birds, and therefore the significance of the one positive Weil-Felix reaction in a bird is at present unknown. The pied currawong is widely distributed in eastern Australia, ranging from Cape York in North Queensland to Otway Forest in Victoria. It is also recorded from Lord Howe Island.[13] However, it does not appear to be a true migratory species. The only birds of the Atherton Tableland that I have found to harbour as parasites larval Trombidiid mites were specimens of the noisy friar-bird (*Philemon corniculatus*). This species of bird is common on the drier part of the Atherton Tableland. Four specimens have been examined for ectoparasites, two of these being from Kaban (recorded in Table V) and the other two from near Irvinebank. All four of these specimens were heavily infested in their external auditory meati, the parasites being larval Trombidiid mites (a species of *Leeuwenhoekia*). This species of bird is a honey-eater and is not classified as a ground-feeder; but probably the infestation is greatly facilitated by the birds' heads being bald. In New Guinea a number of species of birds are recorded as being infested by larval Trombidiid mites; I have even found specimens of a *Trombicula* in the external auditory meati of a hawk at Aitape in December, 1944.

Observations of Reptiles.

In various parts of the world larval Trombidiid mites have been recorded as ectoparasites of reptiles, mainly small lizards, but also snakes to a lesser extent. Australia is no exception, and although as yet these parasites have not been recorded from Australian snakes, infestation of lizards by these mites occurs throughout tropical Australia; I have collected them in the Northern Territory (both Central Australia and the wetter regions between Daly Waters and Darwin) and in North Queensland. In the Northern Territory even large Agamas or "dragons" are usually infested by a few larval Trombidiid mites in their axillæ, and in the groins to a lesser extent, whereas the smaller skinks are usually more heavily infested similarly, and usually have some of these mites in their external auditory meati as well; even geckoes may be infested, although their more usual parasitic mites (Pterygosomids) need to be distinguished carefully. In North Queensland the coastal scrub contains numerous small skinks, the majority of which are heavily infested in their external auditory meati and axillæ. Generally there are at least half a dozen mites in each external auditory meatus; the numbers in the axillæ are more variable, but frequently the mites are present as a cluster. One has only to see the numbers of skinks and their parasitic mites to realize that this relationship can be one

TABLE V.[1]

Species of Bird.	Number of Specimens.	Locality.	Habitat.	Date.	Agglutination Titres.		
					OXK.	OX2.	OX19.
Dacelo gigas (Laughing Kookaburra)	1	W	D.F.	11.4.44	—	n.e.	—
Trichoglossus chlorolepidotus (Scaly-breasted Lorikeet)	5	W	D.F.	16.4.44	—	n.e.	—
	1	W	O.F.	2.5.44	—	—	—
	1	W	D.F.	18.6.44	—	—	—
Cracticus torquatus (Grey Butcher-bird)	1	W	O.F.	20.4.44	—	—	—
Cracticus nigrogularis (Pied Butcher-bird)	1	W	D.F.	18.6.44	—	—	—
Macropygia phasianella (Brown Pheasant-pigeon) ..	1	W	D.F.	18.6.44	1/40	1/20	1/20
Climacteris sp. (Tree-climber)	1	W	D.F.	16.4.44	—	n.e.	—
Eopsaltria chrysorrhoa (Northern Yellow Robin) ..	3	W	D.F.	16.4.44	—	n.e.	—
	1	W	O.F.	29.4.44	—	—	—
Myzantha melanocephala (Noisy Miner)	1	W	O.F.	21.4.44	—	—	—
	1	W	O.F.	24.4.44	—	—	—
	1	W	O.F.	2.5.44	—	—	—
	1	W	O.F.	6.5.44	—	—	—
Strepera graculina (Pied Currawong)	1	W	D.F.	16.4.44	1/2,560	n.e.	1/80
Philemon corniculatus (Noisy Friar-bird)	2	K	O.F.	25.8.44	—	—	—

[1] W, Wondecla K, Kaban; D.F., dense forest; O.F., open forest; n.e., not estimated; "—", no agglutination at 1/20 and higher dilution.

of the most important factors in maintaining the density of a mite population. Many mites were collected from these sources, and these are still being studied. Although at present it is not possible to generalize on the species involved as far as the Northern Territory is concerned, a preliminary examination has shown that in the Cairns region of coastal North Queensland the mites parasitic on the lizards represent a sample of the normal ground population of these mites; that is, they nearly all appear to be the common *Trombicula* there, generally considered as *Trombicula deliensis*, and the species believed to transmit tsutsugamushi disease in that region. Thus the importance of these lizards in the epidemiology of the disease can be appreciated.

It had been hoped to perform some Weil-Felix tests on these reptiles, but the opportunity did not occur. I know of no reference to Weil-Felix tests on reptiles, and it is not known if such a reaction can occur in the case of a reptile. A Weil-Felix test was performed on a goanna (*Varanus* sp.) from Wondecla on April 17, 1944; the result was negative against *Bacillus proteus* OXK and OX19 (OX2 was not tested).

A point worthy of mention is that the mites in the axillæ of lizards are convenient for observation. When the mites are examined *in situ* with a lens they are seen to extrude small white droplets of fluid fæces every few seconds; possibly this fæcal material could be used as a source of rickettsiæ; the mites would not need to be destroyed by grinding as in the technique accepted at present. Thus the mite would be available for subsequent identification and the natural infection rate for the mites might possibly be determined; at present there is no information on this last point.

General Remarks.

Since the natural incubation period for tsutsugamushi disease in Australia is of the order of 13 ± 2 days, it is now possible to use this information to localize foci with a fair degree of accuracy. If the patient was exclusively in the area in question from ten to eighteen days before the earliest onset of symptoms, then the chances of error are small.

It is hoped that those who have investigated other outbreaks will publish an account of their work and thus give us a more complete picture of the localization of foci of the disease. So far the most important work on the prevention of the disease has been done by McCulloch, whose excellent and painstaking researches deserve wider recognition.

Various questions present themselves to anyone investigating the epidemiology of tsutsugamushi. One of them is, why is the Northern Territory apparently free from the disease? To my best knowledge no case has ever been reported from there. Is the disease related to bird migration? Do the main channels of bird migration by-pass the Northern Territory? Is the climate unsuitable? There is no lack of Trombidiid mites, but the composition of this fauna is still being studied from collections made during the war years, and its complete description will not be published for some considerable time. At present the foregoing questions, and many others, must remain unanswered.

Summary.

Over a period of several months all cases of tsutsugamushi disease and other forms of typhus occurring within an Australian military division, on the Atherton Tableland and in the adjacent coastal area of North Queensland, were investigated epidemiologically. The major outbreak was one of 70 to 75 cases of tsutsugamushi disease among 3,000 troops on an exercise at Bramston Beach, north of Innisfail, and 34 of these patients were available for detailed study. In these 34 cases the incubation period varied from 11 to 18 days; the average was 13·1 days and the standard deviation 1·9 days. There was a high degree of correlation between the siting of the eschars and the regions of the body exposed by troops when in foci of the disease. The value of dibutyl phthalate as a preventive of the disease was apparent.

Three cases of typhus contracted from the coastal scrub north of Cairns were investigated. Two of these were of tsutsugamushi disease and the other of North Queensland tick typhus.

One case of tsutsugamushi disease contracted at the edge of the rain forest in the Wondecla-Minbun region of the Atherton Tableland was investigated. A case of murine typhus contracted within the camp area at Wondecla is reported.

Weil-Felix tests were performed on a series of birds from the Wondecla region of the Atherton Tableland. One of these gave a positive result against *Bacillus proteus* OXK at a high titre. The possible significance of this is discussed.

Observations were made on the infestation of birds and lizards by larval Trombidiid mites. The possible significance of these is discussed. It is suggested that birds are of importance in the geographical spread of tsutsugamushi disease. It is suggested that, in the Cairns region at least, lizards are a major factor in maintaining the level of population of the mite vectors of tsutsugamushi disease.

Acknowledgements.

I desire to thank the commanding officers, the officers commanding medical divisions and the pathologists of the Second/Second and Second/Sixth Australian General Hospitals, and of the 104th Australian Casualty Clearing Station for permission to interrogate and examine the patients suffering from typhus whose histories are recorded, and to examine their clinical records and the results of laboratory investigations. Special thanks are due to Staff Sergeant M. R. Sparnon and Sergeant E. W. Jensen for carrying out the Weil-Felix estimations on the birds *et cetera*, and also for carrying out these investigations independently during one period in which I was absent. Major R. E. Britten Jones aided in the identification of the birds. Colonel H. M. Fisher gave permission to include the investigation within the scope of official duties and took a keen interest in the work. I have had the pleasure of discussing the problems involved with many people, whom it is impossible to list fully. Among these, Major R. N. McCulloch deserves special mention for much useful advice. It is desired to thank the Director-General of Medical Services for permission to publish this paper.

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Reports of Cases.

SPLENOPTOSIS AND TRANSPOSITION OF THE COLON.

By NORMAN CUNNINGHAM,
Sydney.

Clinical History.

A.B., a female infant, aged six months, weighed six pounds six ounces at birth in Western Australia. She was said to have had a short umbilical cord and distended abdomen. She was breast fed for the first two months of life and then gradually graded to a two to one cow's milk mixture, with cereals twice daily from the age of four months. The infant was brought to Sydney and referred to me by Dr. Clement Chapman. On examination a tumour which had the sharp edge of a spleen was felt in the left hypochondrium. It was noted, however, that one could get one's finger above the tumour. The liver was palpable. The child was admitted to the pædiatric service of the Royal Prince Alfred Hospital for further investigation with a provisional diagnosis of "splenomegaly cause unknown". As the tumour appeared to have disappeared on one occasion, the possibility of hydronephrosis was considered. Accordingly urography by the subcutaneous method was carried out, and Dr. J. Vote's report was as follows:

There is only faint concentration of the dye in the kidneys, but in one of the skiagrams the pelvis and the calyces of the left kidney are reasonably well outlined and it appears fairly normal. There is a dulness extending laterally to the kidney and in fact the kidney shadow can be almost distinguished as being uniform in shape, practically normal in position and not obviously enlarged, although it appears a little larger than the right. I do not think that the tumour of the left abdomen is due to spleen because of the position of the gastric and colic gas. In a differential diagnosis the following may have to be considered. Retroperitoneal sarcoma, pancreatic cyst, and very remotely some lesion of the bowel.

The report on X-ray examination of the stomach after a barium sulphate meal was as follows:

The stomach was displaced upwards and to the right and emptying was delayed.

The report on X-ray examination of the colon after a barium sulphate enema was as follows:

The enema flowed freely back to the caecum, passing up the right side of the abdomen, across to the splenic flexure, and then down to the pelvis on the left side. The appearance is that of a transposition of the large bowel.

The blood, on examination, was essentially normal. Dr. F. W. Niesche demonstrated that the tumour could be replaced in the normal position of the spleen and that, all points being taken into consideration, it therefore was probably a "wandering spleen". Splenic dulness was absent.

Discussion.

The fixation of the spleen in its normal position is usually determined by peritoneal folds: the gastro-splenic and lieno-renal ligaments which moor the spleen in position, and the phrenico-colic ligament (*sustentaculum lienis*) which supports it from below. The first two form distinct pedicles in a floating spleen,[2] and if the phrenico-colic ligament is abnormal or loose, the spleen, which already moves with respiration and is readily displaced and altered in shape by dilatation of the stomach or intestines, will tend to drop; this stretches the mooring ligaments, and by the pulling on the splenic veins, causes passive congestion of the spleen and enlargement; thus it brings about a vicious circle. The presence of transposition of the colon may indicate an abnormality of the phrenico-colic ligament, which would explain the splenoptosis in this case.

Bohrer[1] describes a case associated with diaphragmatic hernia. Krumbhaar[3] states that the condition may occur in several members of the same family and that the diagnosis depends on the presence of notches, the absence of normal splenic dulness, and the fact that the mass can be returned to the normal position of the spleen.[4]

Splenoptosis may be associated with disease of the spleen, or congenital malformations, or may occur as part of a general visceroptosis. It occurs in only 2% of cases of visceroptosis. Osler states that the spleen has even been found in the sac of an inguinal hernia.

The risk is torsion, which may give rise to an acute abdominal crisis, and the question of prophylactic splenectomy, although not generally advised in asymptomless splenoptosis, has been considered in this case. The rarity of the condition is emphasized by the fact that there have been only four cases of movable spleen classified primarily under that heading at the Royal Prince Alfred Hospital in the past thirty-seven years, and in three of these there was torsion of the pedicle causing an acute abdominal emergency. The age of the patients varied from sixteen to forty-three years. Cases of splenoptosis associated with a diaphragmatic hernia or occurring as part of a general visceroptosis are not included in these figures.

Summary.

A case of splenoptosis is described. It is postulated that this is associated with an abnormality of the phrenico-colic ligament, and transposition of the colon. The criteria for the diagnosis of this condition are set out and other cases occurring at the Royal Prince Alfred Hospital are mentioned.

Acknowledgements.

Thanks are due to Professor C. G. Lambie, Professor H. R. Dew, Dr. L. Hughes, Dr. F. W. Niesche, Dr. M. S. Earlam and Dr. S. P. Bellmaine for their help in this case.

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ACUTE AGRANULOCYTOSIS WITH RECOVERY.

By H. BOYD GRAHAM,
Melbourne.

Clinical History.

A FEMALE CHILD, S.R., was born on November 6, 1944, at full term, her birth weight being eight pounds four ounces; she was the only child of healthy parents. The mother had not had any miscarriages, and the parents had been married for seventeen years and lived in a northern suburb of Melbourne. The baby was fed and cared for extremely carefully, and became well grown, healthy, sturdy, active and intelligent. There is no known familial predisposition to anæmia or to any hæmorrhagic condition. On November 8, 1946, the parents consulted the local doctor because the child was somewhat fretful and listless and had frequency of micturition. The doctor prescribed a mixture containing, in each one drachm dose, *Pulvis Rhei Compositus* one and a half grains, *Sodii Bicarbonas* three grains, *Tinctura Nucis Vomicæ* one-half minum and *Aqua Menthæ Piperitæ*. Of this mixture the child received three doses daily and, in all, twenty-four ounces were prescribed. Insidiously she became mildly jaundiced and pale; she did not have diarrhœa, but the urine and stools were darker than usual, presumably from the long-continued administration of rhubarb and ginger in the mixture; the icteric tinge was noticed towards

the end of December and urinary frequency again became troublesome. The doctor examined the urine frequently without detecting the presence of blood or albumin and attributed the condition to pyelitis. On January 5, 1947, he altered the alkaline mixture to one containing, in each two-drachm dose, *Potassii Citras* five grains, *Spiritus Ætheris Nitrosi* six minims, *Syrupus Aurantii* fifteen minims, and *Infusum Buchu*. At the same time he prescribed sulphadiazine tablets, 0·5 gramme, half a tablet to be taken every four hours. As the child vomited after taking the tablets, the mother discontinued their use towards the end of the second day and could not have used more than eight tablets. No more sulphadiazine was given to the child.

Phase I. Severe Hypoplastic Anæmia.

Between January 8 and January 15, 1947, the doctor noted a rapid and striking increase in pallor, and, finding that the hæmoglobin value had fallen to approximately 35%, he referred the patient for specialist advice and treatment. I saw her first on January 15, 1947. She was very pale but had plenty of strength and was well able to run about. She was well grown and well nourished. The weight without clothes was thirty-one and one-quarter pounds and the height thirty-five inches. The urine was rather high-coloured, but did not yield positive results to tests for bile, blood, albumin or sugar, though there was a prompt reaction to the Rothera test for acetone and diacetic acid. I suspected the occurrence of agranulocytic anæmia and examined the child's mouth carefully without finding any sign of gingivitis or stomatitis.

I elicited the information that three weeks earlier the face had been puffed and that the child had said several times that her teeth were hurting her. No rash or bruising could be found and neither liver nor spleen was unduly large. The right tonsillar gland was the only palpable lymphatic gland, and the tonsils were a little infected and enlarged. The temperature in the groin was only 99·4° F. Immediate admission to the Children's Hospital was arranged and Dr. David Pitt, a resident medical officer, commenced investigations and treatment without delay. The heart was found to be enlarged, the apex being located just outside the nipple line in the fourth left intercostal space. The temperature was 100·2° F.; the pulse rate was 130 per minute but the beats were regular; the blood pressure was recorded as 80 millimetres of mercury, systolic, and 65 millimetres of mercury, diastolic; the child's blood group was O (4).

At the initial blood examination on January 15, 1947, the following findings were made:

Erythrocytes: 1,540,000 per cubic millimetre.
Hæmoglobin value: 35%.
Colour index: 1·0.

Leucocytes: 3300 per cubic millimetre.
Polymorphonuclear cells: 2%.
Lymphocytes: 94%.
Immature cells: 4%.

In the blood film it was noted that the platelets were normal; the red corpuscles were slightly hypochromic in appearance, and there was some anisocytosis with polychromasia.

Dr. Pitt carried out the transfusion of one pint of fresh blood, the patient's mother being the compatible donor. It was decided to give a full diet rich in vitamins; to combat the toxicity and possible infection with penicillin, 30,000 units being given subcutaneously every eight hours; to administer *Mistura Ferri Sulphatis*, two drachms three times daily to counteract the tendency to anæmia; and to give intramuscular injections daily of "Pentnucleotide" 2·5 millilitres to stimulate production of granulocytes. The diagnosis was considered to lie between aplastic anæmia, aleuchæmic lymphatic leuchæmia and agranulocytosis. On January 16, the post-transfusional blood examination was made with the following results:

Erythrocytes: 3,470,000 per cubic millimetre.
Hæmoglobin value: 70%.
Colour index: 1·0.

Leucocytes: 1900 per cubic millimetre.
Polymorphonuclear cells: 11%.
Lymphocytes: 87%.
Immature cells: 2%.

Another blood examination was undertaken on January 18, and the findings were as follows:

Erythrocytes: 4,620,000 per cubic millimetre.
Hæmoglobin value: 94%.

Leucocytes: 3700 per cubic millimetre.
Polymorphonuclear cells: 9%.

The temperature was ranging from 100° to 101° F., and a good response of red blood cells and hæmoglobin had been obtained to the blood transfusion, but the white blood count was still low and the proportion of cells of the granular series was very low, though the patient was still receiving iron therapy, "Pentnucleotide" and penicillin. At this stage, Dr. John Colebatch carried out sternal puncture and prepared smears of the bone marrow. The report on these smears was received on January 20 and read as follows: "Apparent total lack of nucleated red blood cells and only occasional polychromasic forms seen. Granulocytes are also extremely depressed, but the white blood cells are much more numerous than in the peripheral blood." The differential count of white blood cells in the bone marrow smears was as follows: myeloblasts 11%, myelocytes 2%, polymorphonuclear cells 2%, eosinophile cells 1%, large lymphocytes 41%, small lymphocytes 43%. Meanwhile X-ray photographs of the chest and of the long bones had been prepared and the following radiological report was received on January 23: "Marked enlargement of the cardiac silhouette particularly on left side with apparent ballooning in the conus region. Lung fields are clear except for slight increase in bronchovesicular markings. Diaphragm appears normal. No abnormality detected in the epiphyses and shafts of the long bones." Another blood examination was made on January 23, and the findings were as follows:

Hæmoglogin value: 95%.

Leucoytes: 8800 per cubic millimetre.
Polymorphonuclear cells: 5%.
Lymphocytes: 93%.
Monocytes: 2%.

Slight anisocytosis of red blood cells was present. The child was still feverish and granulocytopenic and suffering from progressively deepening apathy, loss of strength and profuse sweating. Penicillin therapy and the use of "Pentnucleotide" were interrupted at this stage as they had not been effective and the illness had reached a new phase.

Phase II. Neoplastic Probabilities.

During the following four weeks everyone concerned had a very anxious time; the patient's condition sank to the lowest depth and the differential diagnosis widened to include such diseases as the leuchæmic tumours, lymphosarcoma, Sternberg's leucosarcoma, Hodgkin's disease and even tuberculous meningitis. On January 23 she developed laryngeal stridor, which waxed and waned in intensity and was strongly suggestive of mediastinal compression. The right tonsillar gland was still palpable and as large as ever, but it was of normal consistency or it would have been removed for biopsy examination. In view of the anomalous enlargement of the cardiac silhouette, the chest was examined with the fluoroscope and it was established that both the right and left borders of the silhouette were pulsating. The patient swallowed a teaspoonful or two of opaque meal and the œsophagus was found to be in normal position and its outline was not distorted. No separate mediastinal mass was detected. The condition was ascribed to cardiac dilatation and not to pericardial effusion. By January 29 the stridor had been much less in evidence for two days, but mild œdema of the face, especially on the right side, was noticeable. On that day, another blood examination was made with the following results:

Hæmoglobin value: 60%.
Leucocytes: 3200 per cubic millimetre.

Polymorphonuclear cells: 2%.
Lymphocytes: 98%.

On February 4, the œdema of the face, which had been present for ten days, was increasing, though there was no œdema elsewhere. From February 1 the right eyelid was drooping and the right pupil was smaller than the left. The patient frequently had a hard brassy cough and was dyspnœic at times, especially when lying flat on the back. The temperature was still in the 100° to 101° F. range; the heart was enlarged; the child was sweating profusely and rapidly losing strength and interest in her surroundings. Dr. Robin Orr made an ophthalmological examination; he reported the absence of papillœdema and expressed the opinion that the other eye signs were probably of central origin.

By this time, Dr. W. MacDonald was resident medical officer in place of Dr. Pitt, and he undertook reinvestigation in preparation for consultation with Dr. Graeme Robertson concerning the neurological features. On February 5 he performed lumbar puncture and, though the child was crying, found the cerebro-spinal fluid to be under increased pressure. The report from the pathology department stated that the cerebro-spinal fluid contained 64 large mononuclear cells per cubic millimetre, 40 milligrammes of protein per 100 millilitres and total chlorides estimated at 745 milligrammes per 100 millilitres. A report from the radiologist received on February 5 indicated that there were no significant changes in appearance in the chest. That day Dr. John Colebatch repeated sternal puncture and the report on the films was as follows: "Extreme depression of granulocytes—only one polymorphonuclear cell observed in 200 white blood cells. The mononucleated cells convey no impression of leuchæmic cells. Occasional polychromasic, but no nucleated red blood cells seen." The differential white blood count in the marrow was as follows: polymorphonuclear cells 0·5%, eosinophile cells nil, monocytes 2%, large lymphocytes 40·5%, small lymphocytes 57%. On February 7, Dr. Graeme Robertson conducted a neurological examination and reported as follows: "The smaller pupil on the right and the right ptosis suggest paresis of the cervical sympathetic on the right. The pleocytosis in the cerebro-spinal fluid affords evidence of intracranial abnormality. Multiple metastases, perhaps involving bone marrow as well as other tissues, afford a possible explanation of the condition." The results of a blood examination made on February 7 were as follows:

Erythrocytes: 2,520,000 per cubic millimetre.
Hæmoglobin value: 45%.
Leucocytes: 5600 per cubic millimetre.
Polymorphonuclear cells: 2%.
Lymphocytes: 98%.

The general appearance of the film was unchanged. On February 10, the following radiological report was received: "Lungs, normal. Heart markedly enlarged to right and to left. No bony changes detected in films of skull, pelvis, arms, femora and tibiæ."

From February 6, three hourly injections of 10,000 units of penicillin were given as the pyrexia persisted and indeed the temperature range was widening to 102° to 104° F. and on February 12 it reached 105·6° F. On February 12 Dr. Vernon Collins examined the patient and recorded his positive findings and his opinion. The positive findings were as follows: "Enlarged tonsils and cervical glands. Puffy face, but no evidence of venous pressure in the neck. Right facial weakness; ptosis of right eyelid; right pupil smaller than left. Heart enlarged to left. Possible enlargement to right of upper mediastinal glands." His opinion was as follows: "Either a neoplasm—thymoma or lymphosarcoma—or leuchæmia. Puffy face attributable to upper mediastinal obstruction, though absence of venous congestion is a difficulty." On February 12, Dr. MacDonald gave the patient a transfusion of half a litre of whole blood and on February 14 the hæmoglobin value had risen to 78%. On that day the temperature rose to 105° F.; the child was drowsy and very apathetic with some neck stiffness; the right facial palsy had increased and the left pupil failed to react to light. She was still having injections every three hours of 10,000 units of penicillin. Dr. MacDonald attempted lumbar puncture on February 16, but the fluid was too blood-stained for reliable estimation of the content of cells, protein and chlorides. He did not persist because the patient was in a deplorable state. The temperature reached 105·6° F.; an urticarial rash was present; the stools were loose and the buttocks were excoriated; the cervical glands had increased in size; anisocoria and the right facial palsy were pronounced. By February 20, the temperature had been above 104° F. each day for fourteen days; facial paresis and œdema of the face were striking features; dyspnœa was pronounced and fluids had to be administered intranasally. Lymphosarcoma was considered to be the probable diagnosis and the radiological examination of the chest was repeated in a search for evidence of the presence of a mass. Blood examination was also undertaken that day and the findings were as follows:

Erythrocytes: 3,820,000 per cubic millimetre.
Hæmoglobin value: 74%.
Leucocytes: 3600 per cubic millimetre.
Polymorphonuclear cells: 5%.
Monocytes: 3%.
Lymphocytes: 92%.

The erythrocytes were slightly hypochromic.

This was the end of another phase of the case history.

Phase III. Granulocytopenia with Intercurrent Pneumonia.

On February 21, the following radiological report was received: "The films present a dense shadow from the mediastinum in the region of the thymus extending out to the right apex. It seems to have a lower margin sharply limited by the interlobar fissure." If this dense mass had been neoplastic in origin it would have given strong support to the ideas on diagnosis then prevalent, but Dr. Colin MacDonald expressed the firm opinion that it was evidence of pneumonic consolidation. The child was sick, pale, weak and helpless, and treatment was rearranged on the assumption that our only hope was to regard the delayed resolution of an apical pneumonia as a manifestation of the effect of granulocytopenia in spite of the adequate penicillin therapy. An article from the *British Medical Journal* of December 14, 1946, had recently arrived and contained details of continuous intramuscular drip therapy in acute agranulocytic angina. It was decided to use the method. From February 21, the continuous intramuscular drip was running for ten days. Ten millilitres of "Pentnucleotide" and 100,000 units of penicillin were added to each 24 ounces of normal saline solution. The drip was running at the rate of ten drops per minute, delivering one ounce per hour. The child's condition improved steadily; she was less pale and more alert; the temperature dropped from 106° F. to the old range between 100° and 101° F. Urine examination yielded repeatedly negative results, though the fluid was tending to make the surface tissues dropsical towards the end of the therapy.

On February 26, Dr. Colebatch again performed sternal puncture. The report on the examination of the bone marrow films was as follows: "Red cells show occasional megaloblasts and fairly frequent polychromasic macrocytes. No evidence of leuchæmia; white cells are still reduced." The differential percentage count of white cells in the marrow was as follows: myelocytes 4%, polymorphonuclear cells 6%, monocytes 1%, immature forms 6%, large lymphocytes 59%, and small lymphocytes 41%. On February 26, further blood examination findings were as follows:

Erythrocytes: 2,350,000 per cubic millimetre.
Hæmoglobin value: 53%.
Leucocytes: 12,600 per cubic millimetre.

No differential leucocyte count was made.

The leucocytosis was a welcome result ascribable to the inflammatory lesion at the right apex under the stimulus of the "Pentnucleotide", though the patient might have

been tided over sufficiently long for blood regeneration to have commenced spontaneously. On February 27, Dr. MacDonald undertook another transfusion of blood, but as a reaction developed, he stopped after introducing 350 millilitres.

By March 3, the patient's general condition had improved; she was much less apathetic; she was attempting to feed herself; and she was able to talk a little to her mother. The temperature range was dropping; from 103° F. on February 27, the evening swing had fallen to 101° F. Progressive œdema of the legs had developed from the long-continued intramuscular drip which, at this stage, was discontinued and the injection method of administration was substituted; 10,000 units of penicillin were injected three-hourly; and five millilitres of "Pentnucleotide" were given each day. To assist diuresis, five minims of *Tinctura Digitalis* were prescribed to be given three times daily. By March 5, the œdema had subsided; even the œdema of the face was less evident; the ptosis had gone; the pupils were equal and reacted

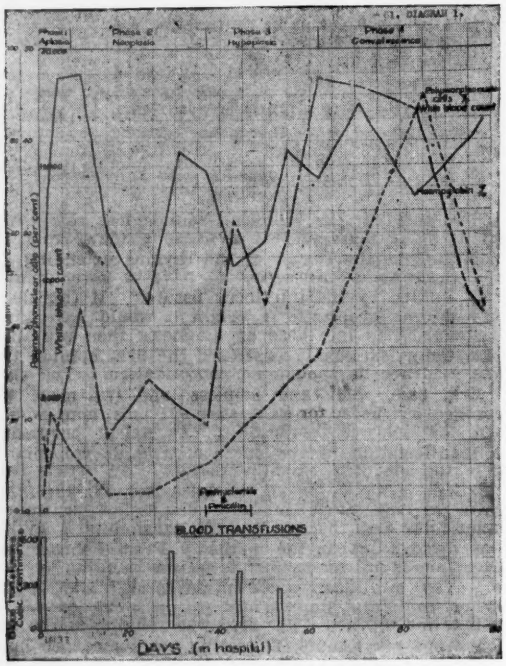

FIGURE I.
Time relationship between transfusions of blood and days in hospital on the one hand and the blood examination findings on the other.

to light; the mouth still drooped at the right corner; the temperature was between 100° and 100·6° F.; the patient was more active and was able to feed herself. On March 5, the blood was examined again with the following results:

Erythrocytes: 2,950,000 per cubic millimetre.
Hæmoglobin value: 58%.

Leucocytes: 8900 per cubic millimetre.

No differential leucocyte count was made.

On March 5, another radiological report was received as follows: "Consolidation is still present in the right upper lobe. Further contraction has occurred, but the appearances suggest that resolution is commencing." The receipt of the above report from Dr. Colin MacDonald dispelled lingering doubts about neoplastic deposits. None of the observers had been able to pick up any crepitations in the right axillary region, but the condition was no longer running the course of a neoplastic disease. On March 8, Dr. W. MacDonald carried out another transfusion of blood, but stopped after the introduction of 240 millilitres. The reactionary temperature reached 103° F., but improvement was noticeable in the patient's colour. Bedsores on the buttock required energetic use of gentian violet solution and removal of pressure by nursing the patient first on one side and then on the other with frequent changes. On March 10, the post-transfusional blood examination results were:

Erythrocytes: 4,250,000 per cubic millimetre.
Hæmoglobin value: 78%.

Leucocytes: 11,800 per cubic millimetre.

By March 17, the child had recovered from right apical pneumonia; crepitations, first heard on March 10, were no longer audible. There had been great improvement during the week; she had become lively, smiling and blowing kisses, sitting up unaided, eating well without assistance and moving about in the bed instead of lying like a log. On March 17, the following radiological report

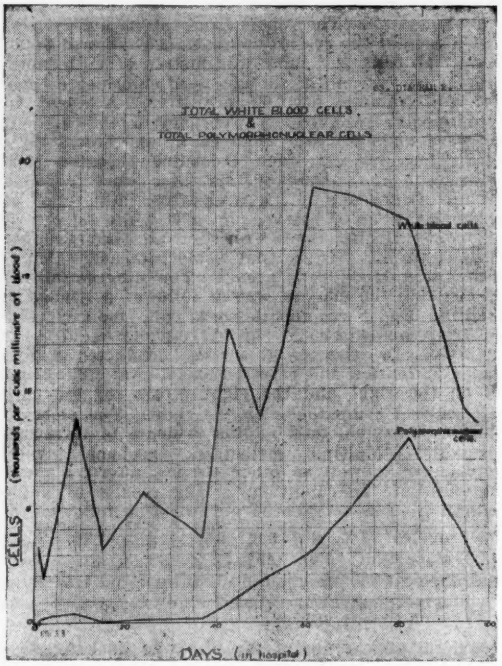

FIGURE II.
Curves showing the relationship between progressive counts of total leucocytes and of polymorphonuclear cells showing how the extreme granulocytopenia disappeared.

was received: "Resolution of the pneumonic process is almost complete in the right upper lobe. The heart appears to be less dilated." That report marked the end of another phase of the case history.

Phase IV. Convalescence with Intercurrent Abscess.

On March 17, a blood examination was made and the findings were as follows:

Erythrocytes: 3,300,000 per cubic millimetre.
Hæmoglobin value: 72%.

Leucocytes: 18,800 per cubic millimetre.
Polymorphonuclear cells: 17%.
Lymphocytes: 83%.

The notable increase in the proportion of polymorphonuclear cells and the raised leucocyte count, taken in conjunction with the great improvement in the patient's general condition, were regarded as signals of convalescence. It was decided to institute liver therapy and to

follow the progress of reticulocytes in the blood. By March 20, further improvement had occurred; the temperature had barely reached 100° F. during the week and the hypoplastic state of the blood had improved considerably. The diagnosis was clearer and the prognosis was immeasurably better. On March 26, another blood examination resulted as follows:

Erythrocytes: 4,420,000 per cubic millimetre.
Reticulocytes: 1·2%.
Hæmoglobin value: 88%.

Leucocytes: 18,400 per cubic millimetre.

On that day, another radiological report was received which read as follows: "Chest clearing; cardiac silhouette appears to have decreased in size, although still a little enlarged both to the right and left." The child was active and interested in her surroundings and the chest had cleared clinically, but the temperature was still reaching 100° and 101° F. in the evenings. She was complaining of pain in the right thigh at the site of introduction of the intramuscular drip, and there was some fluctuation but no tension.

In order to support and to stimulate the formation of red blood cells and to obviate the necessity for further transfusions of blood it was decided to give injections of liver extract, two millilitres daily for three days and then on alternate days and later twice weekly. The child was still receiving ferrous sulphate in a mixture which had only been discontinued for a while in February when she was so very ill. As the temperature rose to 104° F. on March 27, next morning the abscess in the right thigh was opened at the site of pointing, the skin being frozen with an ethyl chloride spray. An amount between three and four ounces of thick yellow pus was evacuated and a glycerin wick was inserted to promote drainage. By the evening of March 29, the temperature range had fallen to between 99° and 100° F. By April 3, though the abscess seemed to be clean without any further purulent discharge, the temperature was rising to 101° F. again. The child was still receiving penicillin, "Pentnucleotide", liver extract and iron therapy, and her general condition was good. On April 6, she complained of pain in the left thigh posteriorly, but there was no other evidence of abscess formation. On April 7, Dr. MacDonald carried out another blood examination with the following findings:

Erythrocytes: 3,350,000 per cubic millimetre.
Reticulocytes: 0·4%.
Hæmoglobin value: 68%.

Leucocytes: 17,400 per cubic millimetre.
Polymorphonuclear cells: 45%.
Eosinophile cells: 1%.
Monocytes: 5%.
Immature primitive cells; 1%.
Lymphocytes: 48%.

The erythrocytes and platelets were normal in appearance.

The erythrocyte count from this examination was disappointing and another blood transfusion may be needed soon; but the differential leucocyte count is encouraging.[1]

Discussion.

In my opinion, the correct diagnosis of the intricate case history which has been recounted at such length is acute agranulocytosis, though there are many perplexing features. In the 1946 edition of Maxwell Wintrobe's excellent book on "Clinical Hematology" there is support for this diagnosis in two respects at least. Werner Schultz, in 1922, made a good case for the recognition of a syndrome of unknown ætiology as a clinical entity to be known as agranulocytosis, but it is a hopeless condition in which severe necrotic lesions of the mouth loom large. Since then synthetic drugs containing the benzene ring with an attached amine have been heavily incriminated as causative agents. Sulphadiazine was given to the patient under discussion at a time when she was in a toxic condition and so, though very little was used, it may have had a precipitating effect. However, that is non-essential to the diagnosis, for at least one-third of the reported cases are of undiscovered ætiology. Wintrobe's other useful observation is that there is good reason for believing that infection is secondary to the leucopenia and granulocytopenia and is not necessarily the cause of the illness. In this case the adequate use of penicillin, which was not available to earlier patients, may well have prevented the sore throat, the pneumonia, the thigh abscess and other infections from reaching the necrotic stage. If it is conceded that four grammes of sulphadiazine can have put the life of this two-year-old child in jeopardy, it will be necessary for all doctors to become acutely sensitive to the diagnosis so that appropriate investigation and treatment may be undertaken in time to save lives. The case history is brought forward at the present stage because of its interest, but it will be fully realized that the present improvement may be merely a remission in the illness. The principles of treatment of acute agranulocytosis are at least four-fold, namely, transfusion of blood, removal of the cause if known, stimulation of granulocyte formation, and such treatment as the use of penicillin to keep infections at bay pending the results of the other lines of therapy, or spontaneous recovery of the hæmatopoietic system.

[1] The patient had a fulminating illness of one week's duration and died on July 19, 1947, of acute lymphatic leuchæmia with widespread lesions and a typical blood picture.

Acknowledgements.

The favourable results of the treatment described could not have been obtained without unusual skill and unremitting attention on the part of Dr. David Pitt and Dr. W. MacDonald, and of Sister Reynolds and her nursing staff. I should also like to acknowledge with gratitude the valuable assistance of Dr. Reginald Webster and the staff of the pathological department, Dr. Colin MacDonald and the staff of the radiological department, Dr. T. D. Hagger, my associate physician, Dr. John Colebatch who carried out the sternal punctures, Dr. Vernon Collins, my corresponding out-patient physician, Dr. Robin Orr, eye specialist, and Dr. Graeme Robertson, neurologist. In presenting the case history of this patient I am merely acting as the mouthpiece for this team.

CONSERVATIVE TREATMENT OF PHIMOSIS.

By H. P. Dunn, M.B., Ch.B. (N.Z.).

It is not generally known that there is a non-operative treatment of phimosis, and indeed the writer was not aware of the fact until he had tried it as an experiment; but there are many precedents to demonstrate the plastic capabilities of thin skin—the great deformity of the upper and lower lips of the "duckbilled" Bantu women; the extreme distortion by heavy ear-rings of the ear lobes of the men of the same tribe; the formation of an artificial vagina by intermittent pressure on the perineum, as described by Dawson (1945).[1]

Clinical Record.

A.B., a male, aged twenty-six years, complained of phimosis since birth, with recurrent balanoposthitis occurring about every two months and lasting three or four days. He was not aware that his condition was abnormal until the age of twenty years, and had discovered that his attacks of local inflammation could be quickly terminated by irrigation of the preputial sac with his own urinary stream. This was achieved during micturition by intermittently obstructing the preputial orifice and distending the sac, thus flushing out smegmal debris. Being on active service at the time of seeking advice, he was unable to enter hospital for circumcision, and as he had planned to marry as soon as his leave came due, this excluded operation and obliged the writer to try non-operative treatment.

The diameter of the preputial orifice when stretched on the glans was about seven millimetres; this was gradually

increased by inserting the tips of artery forceps and stretching the opening by separating the handles three times daily. This procedure was not unduly painful, but adherence to the routine required some little perseverance. At the end of two weeks the prepuce was able to be retracted over the glans for the first time. Subsequent progress was rapid and easy, so that at the end of a further two weeks the condition was normal, the orifice being twenty millimetres in diameter.

A follow-up examination after one year showed that there had been no tendency to constriction of the orifice; the patient had married and marital relations had been normal.

Discussion.

The success of this procedure provides some new facts for the interminable arguments for and against circumcision. Its scope of application is rather limited, because not many men would have the patience to tolerate the discomfort and the slow progress of the treatment. However, it could be tried with intelligent patients who cannot afford the time to enter hospital for a minor operation.

Summary.

A case of phimosis is described, with its successful non-operative treatment.

Reference.

(1) J. B. Dawson: "The Formation of an Artificial Vagina without Operation", *New Zealand Medical Journal*, Volume XLIV, 1945, page 132.

Reviews.

A NEW TEXTBOOK OF OBSTETRICS.

MOST teachers of obstetrics feel the urge, sooner or later, to write their own textbook, if only to incorporate therein those many personal impressions and preferences which derive from a ripening experience in this field. They find in other textbooks an ever-increasing number of points upon which they cannot entirely agree, or which they would themselves have expressed rather differently. Professor Gilbert Strachan, professor of obstetrics and gynæcology in the University of Wales, has recently written such a textbook of obstetrics, and it may be stated at once that it fulfills admirably all the requirements of such a volume.[1] For the reasons stated we feel sympathetically towards Professor Strachan in directing attention, as we must, towards those matters which in our opinion could be improved upon in their manner of treatment, or which, perhaps, would not find general acceptance.

The opening chapters on the anatomy and physiology of reproduction are amongst the best yet encountered in this type of textbook, and one is pleased to see that Spanner's conception of the role of the marginal sinus in the return of venous blood from the intervillous space is now receiving due recognition.

The clinical importance of the interischial spinous diameter of the pelvic cavity might have been given more emphasis either in the section dealing with contracted pelvis, or in the chapter on anatomy. There is a risk that the comparatively recent intensive studies of the contour of the pelvic brim may overshadow considerations of troublesome deviations from normal in the cavity. Professor Strachan, however, appears to be well aware of this, for he writes: "The knowledge of the mere static size of the brim alone does not, by any means, clear up all our mechanical difficulties during labour."

There are some remarkable photomicrographs demonstrating the implantation of the ovum and an interesting note on comparative placentation.

The discussion on nutritional requirements during pregnancy and lactation incorporates most of the recent work of value on this subject, and it is pleasing to note that the unnecessary restriction of protein intake as a "precautionary measure" receives the condemnation it deserves. One wonders whether medical students should have to concern themselves with a variety of alternative explanations covering the mechanics of certain phenomena during labour, such as internal rotation, especially when, at the end of three pages, they learn that "it would appear that the exact cause of internal rotation is not yet decided".

The chapters on the conduct of both normal and abnormal labour reveal Professor Strachan's evident ability to pass on something of his maturity of judgement, his sound clinical sense in the field of obstetrics and his conviction that unnecessary interference is "the beginning of all evil".

The danger of precipitate birth as a cause of intracranial hæmorrhage in the newborn is rightly stressed, as also is the value of vitamin *K* given to the mother before the actual birth in the prevention of clinically significant types of spontaneous intracranial hæmorrhage.

In the section dealing with acute infections in pregnancy, no reference is made of the possible consequences to the offspring of maternal rubella contracted during the first or second trimester.

The discussion on the treatment of eclampsia is disappointing. It contains no reference to the dehydration technique involving the intravenous use of hypertonic solutions of dextrose (though it is suggested that intravenously administered glucose may have a beneficial effect in terms of liver protection and regeneration), nor to the anticonvulsant effects of concentrated (50%) solutions of magnesium sulphate given by intramuscular injection.

The management of both complicated and uncomplicated breech presentation is well described, although the value of local anæsthesia for *primiparæ* in the early stages of the delivery might have been stressed with advantage.

One wonders whether the Lövsett technique for the delivery of extended arms will find its way into students' textbooks. It has some enthusiastic advocates in this country.

Professor Strachan has wisely included a chapter on blood transfusion in obstetrical practice, which clearly defines the clinical implications of recent work on the rhesus factor.

Although one and a half pages are devoted to details of the technique of pubiotomy and symphysiotomy (though concluding with an indication that these measures are only of historic interest), no reference is made to the anticoagulant treatment of venous thrombosis in the puerperium.

But these criticisms merely serve to throw into relief the sterling qualities of the book as a whole—a worthy product of the Welsh school of obstetrics and a valuable addition to the standard literature on this subject.

[1] "Textbook of Obstetrics", by Gilbert I. Strachan, M.D., F.R.C.P., F.R.C.S., F.R.C.O.G.; 1947. London: H. K. Lewis and Company, Limited. 9¼" × 6¼", pp. 746, with many illustrations, some of them coloured. Price: 45s.

UROLOGY IN GENERAL PRACTICE.

THE second edition of Professor Ockerblad's "Urology in General Practice" should enjoy the same popularity as its predecessor.[1] Like any small book on an extensive subject, it is necessarily dogmatic, and one cannot always agree with the procedure recommended. Nevertheless the excellent indexing, well-chosen illustrations and concise but readable prose provide an admirable work for rapid reference by the general practitioner or for study by resident medical officers and students. Moreover, most specialists would acquire something from its perusal.

In some respects American urology differs from ours. Thus a chapter on nephritis is included, "for we believe that doctors . . . are coming more and more to realize that the urologist knows more about the kidney . . . than anyone else". Nor do the management of the systemic manifestations of syphilis and the diagnosis of sterility in women come within the province of the urologist in this country.

The author's attitude to controversial subjects is commendably concise. Of nephroptosis "which some clinicians tend to ignore" he writes: "One-fifth of our women, even today, have movable kidneys. Has the disease ceased to be important?" The alleged difficulty of staining and finding tubercle bacilli is explained and the technique detailed. Discussion of impotence and sterility is both helpful and stimulating, while the chapter on sulphonamides and antibiotics is full of accurate and practical information.

Pains are taken to delineate the respective roles of the general practitioner and the specialist. Whereas generally operative technique is omitted, the complete details of emergency operations are included. The material is well balanced and expansive discussion of favourite topics has been avoided. Hence its chapters might well be taken as an outline of what a resident medical officer should know of urology. This book can be recommended with confidence.

[1] "Urology in General Practice", by Nelse F. Ockerblad, B.S., M.D., F.A.C.S.; Second Edition; 1947. Chicago: The Year Book Publishers, Incorporated. 8" × 5¼", pp. 392, with many illustrations. Price: $5.75.

The Medical Journal of Australia

SATURDAY, OCTOBER 11, 1947.

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"ALL GOES IF COURAGE GOES."

IT has always been the thing to extol courage. The Victoria Cross winner is acclaimed and honoured; the considered brave act of such a one as Captain Oates touches something deep within us; and every medical practitioner has seen gallantry among his patients that excited his admiration and even his reverence. Few can read unmoved Dr. John Brown's superb story of the Scotswoman, Ailie, whose breast was removed by the great J. B. Syme in the days before anæsthesia.

> The operating theatre is crowded. . . . In comes Ailie: one look at her quiets and abates the eager students. That beautiful old woman is too much for them; they sit down, and are dumb, and gaze at her. These rough boys feel the power of her presence. . . .
>
> Ailie stepped up on a seat and laid herself on the table, as her friend the surgeon told her; arranged herself, gave a rapid look at James, shut her eyes, rested herself on me, and took my hand. . . . The surgeon did his work. The pale face showed its pain, but was still and silent. . . .
>
> It is over: she is dressed, steps gently and decently down from the table, looks for James; then, turning to the surgeon and the students, she curtsies,—and in a low, clear voice, begs their pardon if she has behaved ill. The students—all of us—wept like children; the surgeon happed her up carefully,—and, resting on James and me, Ailie went to her room.

Less spectacular, but just as fine, is the fortitude often seen in the incurable patient with a fatal and painful disease, or the resolution which keeps a man at his bread-winning or a woman active in her home despite disability and pain.

Side by side with this honouring of courage, our accepted standards have always despised cowardice; though most of us are hesitant, as in the case of many other human faults, to be the one who casts the first stone. Fear is common to us all, with perhaps rare exceptions, and in our hearts we cannot always predict how we would meet a given situation. None the less we cannot ignore the disastrous effect so often seen in the clinical observation of the individual who refuses to face a challenge, no matter what its nature. In the past such refusal was uncompromisingly condemned, even though the condemnation may have been tempered with charity; it is only comparatively recently that we have realized that the position is not so straightforward. The psychologist has shown us that particular individuals are incapable of meeting particular challenges, and there has been a general willingness to accept the existence of "a type of psychoneurosis which is the expression of an illness of the personality rather than of moral guilt". But the matter has not stopped there and, particularly during the recent war, the attractiveness of a psychiatric diagnosis as a means of escape from moral responsibility has become evident, especially, it seems, in North America. This is, of course, highly controversial ground, but we cannot ignore the warning, coming as it does from an American psychiatrist of no mean experience. Alexander R. MacLean, of the Section of Neurology of the Mayo Clinic, worked for four years among "men who failed the test of war"; he saw them during the recruiting and training stages, he followed them in action overseas, and met them again back in hospitals on the mainland; and what he saw has evoked a strong criticism,[1] not so much of the men, as of the "distorted psychiatric concepts" which he feels are endangering our ethical standards and undermining morale. He speaks of the two words customarily used "to describe the intangible realities which win or lose battles": courage—"that moral quality in the face of fear, difficulty and danger, from which springs unselfish conduct"; and cowardice—"the quality which, when fear is a motive, results in selfish behaviour that is contrary to the mores of the group". Then he traces the gradual development of an attitude towards human standards and behaviour which has received wide current approval; in this man has become "a relatively irresponsible organism, the product of instinct and environment . . . an animal whose behaviour is determined by psychologic and biological laws acting within an ever-diminishing framework of choice in decision". He continues:

> With this increasing popular recognition of the impact of an individual's past on his present and future behaviour, the ethics of our civilization have correspondingly been interpreted in freudian and behaviouristic terms. Morality is defined in words of instinct and the conditioned reflex, and this scientific language, although it does not change the essence of the thing described, serves to remove the stigma of amoral action.

Then he suggests the logical but much less palatable corollary:

> . . . if we are to admit that there are such qualities as courage and fortitude, we must equally insist that there are cowardice and weakness of character. For if we turn our faces away from the possibility of unethical behaviour, the decoration of our men for valour in battle, and our verbally expressed appreciation of the sacrifices that men have made of their limbs and lives in the defence of their country, become worthless, hypocritical rewards given by a cynical people.

MacLean does not for a moment deny the existence of the psychoneurotic disorder which incapacitates the individual and which is beyond his control or mastery. Such a man is not responsible for his failures. But he does insist on the existence of, firstly, frank cowardice, "a callous, unmixed selfishness", and of, secondly, the refusal of an individual to conquer or allay, in the face of an unpleasant alternative, a degree of psychoneurotic disability within his power to control. He questions the competence of civilians to judge in these matters, but calls to witness the men who have endured and who have remained in service in spite of the temptation to seek exit through the wide

[1] *The Canadian Medical Association Journal*, March, 1947.

open portals of psychiatric discharge. . . . The descriptive words they use in relation to men who left them in the teeth of danger and returned to civilian life capable of work and life as they had known it in the past, are perhaps unthinking and certainly often are profane and vulgar. In their unscientific, descriptive terminology, nevertheless, there is a thread of justice and truth. For, to say it once again, nearly all men have fear and know insecurity, frustration and exhaustion, and most of them have known adult tears. Men who stayed in uniform saw other men leave for home because of symptoms which they themselves concealed and endured. . . . The symptoms of depression of spirit, anxiety, trembling, sweating, anorexia, sleeplessness and gastro-intestinal upsets with exhaustion, were not sufficient in themselves to make most men choose to desert their fellows. The lack of another quality was necessary and that quality remained on an ethical and moral plane.

It may be objected that a medical adviser has no concern with the moral aspects of his patient's acts, that science knows nothing of ethics. There is an essential truth in this, but as a generalization it is only a half-truth. The doctor approaching his individual patient must put aside personal feelings, he must be prepared neither to praise nor to blame, but to lay the problem dispassionately in the open to be dealt with there. But ultimately he cannot ignore motives and sooner or later is faced with the claims of accepted ethical values. He may choose the behaviourist viewpoint and abide by it, but many find that it involves them in extensive mental gymnastics. The behaviourist viewpoint is much easier to accept in the library or the laboratory, but it is full of disquieting anomalies for the man in constant contact with real people and their problems. And the man in the street—or the soldier in the field—will have none of it. We may clearly demonstrate, either by the philosophy of the ancients or by the psychology of the moderns, the fallacy of freedom of will and the absurdity of absolute moral or ethical values; yet the average man, poor benighted creature, insists that he sometimes acts deliberately, that he is sure that certain things are right and wrong, and that he even accepts responsibility for many of his actions. Surely these are the threads with which we weave life's pattern; if we discard them we have nothing left but futility and cynicism, and what cloth can we weave with them?

The attitude that MacLean takes is a severe one and he is most critical of his own specialty, psychiatry, which he holds responsible for a breakdown in morale far more extensive in its effects than the local sphere of a war now terminated.

Ethical defects concern the whole of our society, and people should know the implications of a disorder, bred in the North American continent, which rendered many thousands of men unfit for combat. This problem did not begin with war, nor will it end now that peace is here.

Revaluation of the standards behind our way of life is essential, and MacLean feels that much of the onus to do this is on psychiatry. Further he states: "I do not believe that we, as men of medicine, are qualified to judge others on an ethical plane, but I do believe that it is our duty to scrutinize our personal as well as our national lives as though we were responsible citizens capable of distinguishing right and wrong."

This "disorder, bred in the North American continent", is not blocked by quarantine regulations, and one wonders how much of the sickness is in our own society. We started by thinking of courage and found the unpleasant truth that, if we discarded the conceptions that cowardice and failure to accept responsibility are blameworthy, then courage ceased to have any meaning. Far from acquiescing in this, we must cultivate courage, for we surely need it and are going to need it in today's world. We would not decry measures for social security, but must beware that they do not sap our strength and unfit us to deal with larger issues. Freedom from fear and freedom from want are fine, provided they do not lead us into a dream-world of false values:

> In the hollow Lotos-land to live and lie reclined
> On the hills like Gods together, careless of mankind.

We do well to think about the words of the German pastor, words that cannot be accused of glibness, for he wrote them from his cell in a Nazi prison:

> Without struggle and without suffering nothing really great can come about in this world.

Edward Glover concludes his book on "The Psychology of Fear and Courage" with Gilbert Murray's translation of a passage from Euripides' *Bacchae*:

> What then is wisdom? What of man's endeavour?
>
> To stand from Fear set free, to breathe and wait,
> To hold a hand uplifted over Hate.
> And shall not Loveliness be loved for ever?

"To stand from Fear set free" is not to have escaped it, but to have mastered it, and that is the sphere of courage. Without courage we are at the mercy of every ill of the body and of the mind, of the nation and of the race. Most of us know times when we would give all our fame "for a pot of ale and safety". But there is far more to it than that. As Sir James Barrie says: "Courage is the thing. All goes if courage goes."

Current Comment.

TOXICITY OF HUMAN PLASMA.

INJECTIONS of human plasma were soon found to have occasionally awkward consequences never anticipated by the early advocates of this procedure. Numerous articles appeared in *The Journal of the American Medical Association* from the year 1941 onward dealing with this topic mostly on the clinical aspect.[1] Experimental investigations were also conducted in biochemical and physiological laboratories.[2] Amongst the factors bringing danger to the recipient (apart from the direct transmission of actual diseases like syphilis which apparently and quite inexcusably has occurred) were the following: the purely immunological, including a high concentration of agglutinins in the injected plasma; pyrogenic substances in water or other material employed; insufficient citrate or the use of Ringer's solution instead of water in reconstituting desiccated plasma, both leading to small masses of coagulated matter; high content of potassium or of hæmoglobin; contamination of the plasma during handling or storage; mere keeping of the plasma in a liquid state, and finally heating of the plasma to temperatures above 37° C.

R. Caldeyro, of the Institute of Experimental Medicine in Montevideo, Uruguay, has recently made an experimental survey of these causative agents, giving further details about accepted changes and adding a new factor.[3] Caldeyro injected the plasma under investigation into

[1] Editorial: "Toxicity of Human Plasma", *The Journal of the American Medical Association*, Volume CXX, 1942, page 206.

[2] H. G. Gilding and M. E. Nutt: "Changes Occurring in Plasma and Serum on Storage and Their Physiological Effect", *Journal of Physiology*, April, 1944. (This contains an excellent bibliography.)

[3] R. Caldeyro: *"Estudio experimental de la toxicidad del plasma sanguineo humano"*, *Archives de la sociedad de biologia de Montevideo*, Volume XIII, 1947, page 187.

rats and guinea-pigs and also measured the fall of arterial pressure in cats, using throughout consistent controls. His method of estimating the toxicity quantitatively was to take as unit the amount necessary in doses of 1·0 millilitre per kilogram of cat and with a velocity of injection of 0·2 millilitre per second, to produce a fall of 20% arterial pressure. His more important findings are as follows. Plasma kept in the frozen state develops no toxicity, even after a year's storage; on the other hand spontaneous toxic changes take place at temperatures above the freezing, even at 4° C. to 6° C., and as might be expected the rate of change increases with the rise of temperature; at room temperatures a toxic action is discoverable on the third day; heating of the plasma to 45° C. for ten minutes resulted in definite formation of toxic qualities. Accidental contamination of the plasma during handling produced negligible results.

The most original portion of this research is the claim that plasma should always be obtained from the donor in a pre-prandial condition, never in a post-prandial. Caldeyro calls the latter "lipæmic" plasma and has measured its powers of lowering arterial pressure, whereas pre-prandial plasma has no such action. Just why "lipæmic" plasma should have untoward complications is not explained and is difficult to understand. It is well known that post-prandial plasma contains a higher concentration of fat in ultra-microscopic dispersion, but the particles are so small that embolism can be ruled out; even the units of fat emulsion in the thoracic duct lymph are well below capillary dimensions as might be expected *a priori*. Much more likely is his suggestion that minute quantities of undigested protein can enter the blood stream from the food and act allergically on the receiver. Caldeyro admits that the toxic action of post-prandial plasma is small and it is just possible that his findings have a greater academic than practical interest.

THE INTERVERTEBRAL DISK.

The American Orthopædic Association, at its annual meeting last year, conducted a symposium[1] on the intervertebral disk, whose aim was "to determine, if possible, the points upon which there was general agreement, and to explore the possibilities of resolving differences in diagnostic approach and therapy". It was hoped that the "taking stock" and recording of salient facts would serve to clear away some of the confusion in a new field, and would help to reconcile divergent points of view between neurosurgeons and orthopædic surgeons.

Intervertebral disk disease had, before 1934, excited little interest. In this year W. J. Mixter and J. S. Barr[2] focused attention upon the condition by reporting nineteen instances of ruptured disk with involvement of the spinal canal. The chairman at the symposium expressed the opinion that the work of these two men had struck the medical profession like a mental tidal wave. If we carry the metaphor a little further, and go back to the "ante-diluvian" period, we find that the textbooks of that time were vague on the causes of "sciatica", but expansive on the methods of treatment, advocating *inter alia* stretching the sciatic nerve, injecting it with large volumes of saline solution, and even puncturing it with a series of needles. The last method, although dignified by the term "acupuncture", is perhaps more reminiscent of native races trephining the skull to permit the escape of evil spirits than suggestive of a reasoned therapeutic measure. The discovery of a definite clinico-pathological entity in relation to low back pain and sciatica meant that a logical approach to the problem was brought a big step nearer.

For a new method to be more loudly acclaimed than is at length seen to be warranted, is a phenomenon not confined to the science of medicine. There is reason to believe that some surgeons have been over-enthusiastic in advising disk operations for the relief of sufferers from backache and sciatica, and that it would not be inappropriate for those who work in this new sphere to study the findings of others, and to apply sober criticism to their own results as evaluated after a suitable lapse of time. Further reference will be made to end-results and to the residual complaints such as weakness in the back and numbness in the leg which may follow operations on the intervertebral disk.

First let us look briefly at the anatomy and physiology of the intervertebral disk. The semi-solid *nucleus pulposus* is contained within a tough *annulus fibrosus*, and is separated from the adjacent vertebral bodies by a plate of cartilage. The *nucleus pulposus* is incompressible, but the slight "give" in the annulus confers elasticity and flexibility on the joint. There is evidence that osmotic interchange occurs through the cartilage plate between the spongiosa of the vertebral body and the nucleus, tending to maintain the turgidity of the latter. Further, there is evidence that injury to, or age changes in, the annulus or cartilage plates may lead to desiccation of the nucleus. It is possible, even, that a diurnal variation occurs in the fluid content of the disk, since it has been shown that the average male is three-quarters of an inch and the average female half an inch taller on rising in the morning than on retiring at the end of the day. Age changes occur both in the nucleus, which becomes progressively fibrosed, and in the annulus and the cartilage plates, which develop clefts and other deficiencies.

The term herniated *nucleus pulposus*, formerly widely used, tended to suggest an oversimplification of the condition, and it is becoming increasingly appreciated not only that the protrusion of a portion of the nucleus and compression of a nerve root are not the whole problem, but that intervertebral disk disease of clinical and pathological significance may be present without protrusion. In disk derangement we are dealing with a dual problem, firstly a disorder of spinal mechanics, and secondly the effects of spinal nerve compression and irritation. The intervertebral articulation consists of the disk between the bodies anteriorly and the two zygapophyseal joints posteriorly. Adjacent vertebræ are connected principally by the anterior and posterior longitudinal ligaments, the *ligamenta flava*, and the interspinous, supraspinous and intertransverse ligaments. When the disk degenerates or part of its substance is lost by protrusion, or both of these events occur together, the space between the neighbouring bodies is reduced, and the ligaments mentioned become slack. At operation excessive mobility of the vertebræ can often be demonstrated. The changes lead to abnormal ligamentous strain and to subluxation and degenerative changes in the zygapophyseal joints. These effects must be borne in mind when symptomatology and treatment are being considered.

Much has been written on the clinical features of disk disease, as, for example, by O. R. Hyndman,[1] and only a brief reference will be made here. Some patients with "soft" or degenerating disks will complain of a low backache with, possibly, some downward radiation, and will show various evidences of spinal dysfunction, such as scoliosis. In other patients involvement of a nerve root may lead to pain in the segmental distribution, possibly brought on or aggravated by coughing and sneezing, and to various neurological effects such as altered cutaneous sensibility and changes in reflexes. Of the latter the commonest is loss of the ankle jerk, which suggests, but does not prove, compression of the first sacral root. As might be expected, the patients with signs of nerve compression often give a history of preceding backache, but in some instances the protrusion is acute and the neurological effects are sudden and crippling.

Diagnosis is based on the clinical findings and is greatly assisted by the fact that in over 90% of cases the disk affected is the fourth or fifth lumbar. When the clinical picture is obscure, a second or third examination after an interval may detect evidence not at first apparent. Divergent views are held on the use of radiography in the diagnosis of disk disease, but there is a pronounced swing away from the use of radio-opaque substances such

[1] *The Journal of Bone and Joint Surgery*, April, 1947.
[2] *The New England Journal of Medicine*, Volume CCXI, 1934, page 210.

[1] *Archives of Surgery*, September, 1946.

as lipiodol, as any residue in the subarachnoid space appears capable of exerting an unfavourable influence. One of the pioneer workers, J. S. Barr,[1] claims that the majority of United States surgeons believe that pre-operative myelography is indicated in almost every instance, and advises the use of "Pantopaque", the medium to be removed by aspiration when the X-ray examination is concluded. This removal is possibly more easily described than carried out. J. Grafton Love[2] supports the employment of myelography, but advocates the use of air or oxygen as a contrast medium. He concedes that these gases give less definition and less accuracy, but finds them adequate and prefers to avoid leaving persistent media within the theca. Other surgeons, such as Hyndman (*loco citato*), do not recommend routine myelography, and in a series of 53 consecutive patients operated on for disk protrusion, recently reported in this journal by Douglas Miller and G. Vanderfield,[3] none was examined by myelography. Probably the wisest course would be to reserve the method for the doubtful case. In any event the precaution of examining the lumbo-sacral region by antero-posterior and lateral X-ray photographs must not be neglected, as it will help to exclude other conditions such as metastatic deposits, while in a small proportion of cases, narrowing of an intervertebral space may be demonstrable and may support a diagnosis of disk disease.

When treatment is being considered there is a danger that the striking success which occurs in some of the cases in which the patient is subjected to surgery may distract attention from the probability that conservative measures will achieve the relief of symptoms of at least half of the sufferers. In any event, without a very clear indication, recourse to surgery should not be advised until after an adequate trial of efficient conservative measures; of these, the essential is rest, preferably in a plaster spica. Miller and Vanderfield's 53 operation cases were selected from a series of 107 patients with presumed intervertebral disk sciatica. The other 54 patients were successfully treated by conservative measures (chiefly immobilization for one month in a short leg plaster spica).

There is again no unanimity as regards the type of operation which should be performed, the conflict of opinion centring mainly on the question of whether or not a spinal fusion should be done. It is not surprising that speakers at the symposium conducted by the American Orthopædic Association strongly favoured some form of spinal fusion, most preferring the "clothes-pin" method of Bosworth. Barr (*loco citato*) goes so far as to state that no patient who has had a ruptured intervertebral disk removed can have a mechanically and anatomically normal spine, and that at least half of the patients who have had such an operation performed without fusion of the spine suffer some degree of weakness or pain in the back. Barr maintains that in some of these the disability is incapacitating. He considers that arthrodesis should be carried out in practically all cases, if (as he considers possible) it can be done without unduly increasing the operative risk or prolonging the convalescence.

By contrast, the neurosurgeons have been content to restrict the operation to a "removal" of the disk and of the *ligamentum flavum*. This has been Dandy's practice, and in Miller's series no arthrodeses were performed. It seems reasonable to conclude that fusion is advisable in a proportion of cases, particularly those in which abnormal mobility of the vertebræ is demonstrable at operation, or in which the ligamentous, as contrasted with the neural pain, has been prominent.

Some large series are now available which permit a consideration of the results of surgical treatment. From 1941 to 1944 Walter E. Dandy operated upon 843 patients, the technique consisting of "removal" of the disk after an excision of the *ligamentum flavum* on the side of the sciatic pain, and R. E. Lenhard[4] followed up 513 of these patients in March, 1945, 147 by examination and the remainder by *questionnaire*. Altogether 63% were classified as having obtained good results, 20% as improved and 17% as not improved. Even the "good result" patients included many with residual complaints such as back stiffness and numbness in foot or leg. Those grouped together as "improved" had much less pain and disability than before operation, but their complaints were such as to cause loss of time or restrict activity. In none of these cases had fusion of the spine been performed. No mention is made of operative mortality. Barr (*loco citato*) analyses the result (as at February, 1946) of 234 operations for disk lesions performed between 1939 and 1943. In 102 of these patients the spine was fused. In this series a more detailed *questionnaire* was submitted, and the results do not readily lend themselves to condensation. It may be said that they were slightly better in the series treated by arthrodesis, but the full meaning of these results is lost in the absence of information regarding the conditions present in each series before operation. If it is assumed, as seems likely, that the patients upon whom fusion was performed were those with evidence of more profound spinal disability before operation, then the slight but definite superiority with fusion becomes more significant. From the Office of the Surgeon-General of the United States come further figures. Between early 1942 and September 1, 1945, 2858 patients with ruptured disk were treated by operation in neurosurgical centres of the Zone of the Interior. A 20% sampling of this total was carried out. Of 483 enlisted men, two-thirds had been discharged from the services, and only one-third were still in service on August 1, 1944. Among officers the figures were much better, 85% remaining on service. Of 328 patients not operated upon, 22% remained on service, and 78% had been discharged.

In conclusion, it may be said that Mixter and Barr rendered a great service in drawing attention to the relationship of the intervertebral disk to backache and sciatica, but that unanimity has not yet been reached on methods of diagnosis and treatment. A clear indication should be present before operation is considered, and in most cases conservative treatment should be given a fair trial. A disk operation is no more a panacea for backache than is an appendicectomy a cure for all patients with abdominal pain.

[1] *The Journal of Bone and Joint Surgery*, April, 1947.
[2] *The Journal of Bone and Joint Surgery*, April, 1947.
[3] THE MEDICAL JOURNAL OF AUSTRALIA, August 16, 1947.
[4] *The Journal of Bone and Joint Surgery*, April, 1947.

ENGLAND AND WALES IN THE YEAR 1945: A STATISTICAL REPORT.

THE Registar-General's Statistical Review of England and Wales for the year 1945, Part I, has been published. It is a terrifying collection of figures set out in thirty-two tables covering 323 pages. Part I bears the title "Medical" and information of interest to Australian readers may be extracted from it.

The population (estimated) is set out in two categories—the total population and the civilian population. The total population includes the armed forces and merchant seamen at home and abroad; it excludes non-civilians of foreign countries, dominions *et cetera* temporarily in the country. The civilian population has been adjusted to allow for the increased rate of demobilization during the latter part of the year and is "appropriate for the calculation of civilian death rates". The total population for 1945 was 42,636,000 persons (20,549,000 males and 22,087,000 females); the civilian population was 38,157,000 persons (16,412,000 males and 21,745,000 females). The number of deaths for the year was 488,108, a crude death rate of 12·6 per thousand living. This was the lowest rate since 1939, with the exception of 1942 when the rate was 12·3. The comparative mortality index (to base year of 1938 taken as unity) was 0·893—the lowest figure in the whole table which records the rates since 1841. Some interesting figures appear in the pages devoted to comparative mortality indexes for certain causes of death. It should be explained that the comparative mortality index expresses each cause mortality of each year as a ratio to that of a base year (in this instance 1938) after adjustment for all differences in the populations exposed to risk and (in this instance) for changes

in cause assignment from 1940 onwards. In this instance for the better appraisment of the figures the 1938 crude death rates per million are shown. Several examples showing the excellent state of health during 1945 may be quoted. For diphtheria the crude death rates for 1938 were 71 per million for males and 68 for females; the comparative mortality indexes for 1945 were 0·253 for males and 0·239 for females; these figures were the lowest since 1936. For all forms of tuberculosis the figures were: for 1938 (crude death rates) 743 per million for males and 506 for females; the indexes for 1945 were 1·168 for males and 0·922 for females. The index for males was higher than for the two previous years, but lower than for 1942; the index for females was the lowest since 1936. For influenza the indexes were low—0·555 for males and 0·548 for females. For malignant disease the picture may best be shown by the index for males and females combined; the indexes for 1945 and 1944, respectively 0·932 and 0·975, were the lowest since 1924 when the figure was 0·982. For rheumatic fever the indexes for 1945 were 0·659 for males and 0·468 for females. For all forms of pneumonia the index for 1945 for both sexes combined was 0·670.

The number of deaths from violence during the year was 12,401 among males and 8278 among females. The civilians who died as a result of the operations of war included 1202 males and 1202 females. Motor vehicle accidents accounted for the deaths of 2529 males and 1069 females, the total being smaller than for any year since 1935.

The infant mortality rate which reached a low record figure of 45·44 per thousand live births in 1944, rose to 46 in 1945. The maternal mortality rate continued to diminish, becoming 1·47 per thousand total births.

AN OUTBREAK OF SMALLPOX

SMALLPOX is something outside the experience and, probably, the imagination of most people in this country. Quarantine measures have proved effective in excluding the disease, and so vaccination, except that of those about to leave the country or of those organized as in the armed forces, has fallen largely into disuse. A recent experience in the United States is worth pondering. Emil E. Palmquist, Director of Public Health in the City of Seattle, Washington, reports[1] that a soldier returning from Japan developed smallpox on board ship. On arrival at Seattle on February 3, 1946, he was transferred to the isolation unit of the army hospital in the city. All patients and personnel in the isolation unit were vaccinated on the following morning. Among the patients was a woman awaiting discharge from hospital after treatment for diphtheria. She was an "up" patient and moved about the hospital, but had no direct contact with the smallpox patient. She was eventually discharged from hospital, but became ill; a diagnosis of vaccinia was made on February 19. The next day she was admitted to the isolation ward of King County Hospital (Seattle is in King County) and five days later her condition was reluctantly diagnosed as smallpox. Lack of suitable facilities and shortage of staff interfered with effective isolation, and on March 9 and 10 four in-patients with clinical features suggestive of smallpox were transferred to the isolation ward; subsequently, but again reluctantly, a diagnosis of smallpox was made in each case. By March 25 there had been 17 cases and three deaths and exposure had occurred outside the hospital. Then a spectacular campaign for vaccination was instituted; the community responded in a remarkable way and the epidemic waned. The last case had its onset on May 12 and the patient died on May 17. In all 51 cases occurred in King County and 16 patients died; approximately half of the infections were of the severe type. The disease occurred among the very young and the adults of middle and older age; a vaccination campaign which had been in progress in the schools for some time probably accounted for the age-distribution. Of the smallpox patients, 98·3% had never been vaccinated, had been vaccinated after exposure, or had been vaccinated four or more years prior to exposure. Palmquist remarks that the adult group had been neglected, and that it was doubtful whether, without the compulsion of fear, any extensive adult immunization programme would have been successful. It is interesting to note that the outbreak stimulated widespread voluntary submission to vaccination not only in Seattle, King County and the State of Washington, but elsewhere in the United States and in the neighbouring province of British Columbia in Canada. It is suggested by the Canadian authorities that the favourable response, which greatly exceeded the response to previous threats, was due to education regarding the value of immunization resultant on the establishment of generalized public health services and also to the "carry-over" to the civilian population of the educational effect of the armed forces' programme of immunization.

This incident brings forward once again the position in Australia. There appears to have been no culpable failure or even lack of reasonable care in Seattle; a channel of infection, a susceptible group in the community, and a medical profession lacking practical acquaintance with the disease were sufficient to let an epidemic start which had taken a toll of lives before it was stopped. It is not intended as an adverse reflexion on our quarantine authorities or on the average practitioner to suggest that it could happen here. It may be that without an actual threat people would not show great interest in a vaccination campaign; but the presence in the community of a large number who have undergone successful vaccination in the forces without undue ill-effects, should have created a reasonably favourable situation that warrants exploitation.

[1] *Canadian Journal of Public Health*, May, 1947.

A SUBSTITUTE FOR MORPHINE.

FOR some years the National Research Council in the United States, through its Committee on Drug Addiction, has been searching for an effective analgesic drug without the capacity of morphine to cause addiction. The most promising of the drugs investigated was methyldihydromorphinone hydrochloride (metopon hydrochloride), but previous reports indicated that its preparation on a commercial scale was scarcely practicable. However, a statement of interest has now been issued by the committee indicating that this drug is to be made available.[1] It is stated that metopon hydrochloride, which is a morphine derivative, is like morphine qualitatively but not quantitatively. Its analgesic effectiveness is at least double and its duration of action is about equal to that of morphine; it is nearly devoid of emetic action; tolerance to it appears to develop more slowly and disappears more quickly and physical dependence builds up more slowly than it does with morphine; therapeutic analgesic doses produce little or no respiratory depression and much less mental dulness than does morphine and it is relatively highly effective by oral administration. The committee considers that it is "in a class by itself for the treatment of the chronic suffering of malignancies", and it is for that purpose exclusively that it is being manufactured and marketed. It is to be available only in capsule form for oral administration for the relief of chronic pain in subjects of cancer; submission of an official order form with a signed statement regarding the proposed use is required. Record cards are being supplied for every patient treated, for return in due course to allow central assessment of the results of the drug's use in general practice. The dose is 6·0 to 9·0 milligrammes (two to three capsules), administration being restricted to a minimum and only on recurrence of pain.

Presumably we can only watch, in this country, to see the results of this further therapeutic trial. It is to be hoped, however, that, if the results are satisfactory, it will be possible to make generally available this further weapon in the fight against pain.

[1] *The American Journal of Medicine*, July, 1947.

Abstracts from Medical Literature.

MEDICINE.

Non-Organic Albuminuria.

J. H. AHRONHEIM (*The Urologic and Cutaneous Review*, January, 1947) classifies non-organic albuminuria into emotional, orthostatic and incidental types. The emotional type is the most common, and the author believes that most cases of so-called orthostatic albuminuria are really emotional in origin. The author describes a simple procedure to differentiate organic from non-organic cases. If the history and physical examination reveal no abnormality and if the urine is microscopically normal and has an adequate specific gravity, the patient is asked to save all specimens passed in the next twenty-four hours in separate clean containers. He should pursue all normal activities, but avoid unusual physical exertion; no dietary precautions are necessary. If the specimens show the typical fluctuating albuminuria with at least one specimen albumin-free, it is safe to consider the condition as non-organic. Non-organic albuminuria is most common in the adolescent and young adult and decreases in frequency at a greater age until it disappears entirely in the even older. However, severe emotional stimuli will cause albuminuria regardless of age.

Heart Changes in Uræmia.

R. LANGENDORF AND C. L. PIRANI (*American Heart Journal*, March, 1947) have recorded the electrocardiographic changes and morbid anatomy of the heart in twenty-seven subjects who died of uræmia. The only demonstrable characteristic anatomical lesion was pericarditis, usually serofibrinous or fibrinous, which was present in twelve of the twenty-seven subjects. The myocardial changes were those attributed to hypertensive heart disease with additional diffuse fatty degeneration, cloudy swelling and interstitial œdema; there was no evidence to suggest that there is a specific uræmic myocarditis. Amongst the electrocardiographic changes observed were the tall narrow *T* waves of potassium poisoning and the prolongation of electrical systole which occurs with hypocalcæmia.

Chemical Factors in Pernicious Anæmia.

H. K. KING (*Edinburgh Medical Journal*, January, 1947) discusses the chemical factors in pernicious anæmia and states that the disease is a megalocytic anæmia, in which there is an idiopathic failure of the stomach to produce an "intrinsic factor" which normally interacts with a dietary "extrinsic factor", and this results in failure of the formation of the "liver factor". The last-named is a hormone which is stored in the liver and is essential for the production of normal erythrocytes. The condition may be treated by oral or parenteral administration of concentrates of the hormone prepared from liver, or by oral administration of stomach preparations, which replace the deficient "intrinsic factor". Progress in isolating and investigating the chemical factors involved has been seriously impeded by the lack of any adequate means of assaying anti-anæmic potency. The intrinsic (gastric) factor is a typically thermolabile protein, possibly a proteolytic enzyme, and the nature of the extrinsic (dietary) factor is unknown. Various methods of fractionating the liver factor yield material which exhibits high clinical potency, but is possibly grossly impure. The liver factor is relatively thermostable and the available evidence suggests that it is a polypeptide in structure.

Treatment of the Anginal Syndrome with Thiouracil.

SOLOMON BEN-ASHER (*American Heart Journal*, April, 1947) presents the results of treatment with thiouracil of 37 patients suffering from *angina pectoris*. The study of these patients extended over a period of thirty-two months, and it was found that the drug was effective in the treatment of that disease. Beneficial results were obtained in 25 (67%) of the patients, and the onset of improvement began, on the average, after three weeks of therapy. The danger of toxic reactions is a definite drawback in the use of the drug, as it is in hyperthyreoidism. In this series fever and neutropenia were the only ill effects observed. Five patients developed fever in the first ten days of treatment, and three patients developed neutropenia in the fourth month of treatment. The smaller daily dose of 0·4 gramme was found almost as effective as the larger dose of 0·6 gramme. The author emphasizes that all patients receiving thiouracil should be carefully observed, particularly with reference to the blood.

Peptic Ulcer.

F. D. MOORE, W. P. CHAPMAN, M. D. SCHULZ AND C. M. JONES (*The Journal of the American Medical Association*, March 15, 1947) describe the results of resection of the vagus nerves in peptic ulcer. Both vagus nerves were resected in 40 patients with jejunal, sternal and duodenal ulcers. Results were good in the case of 33 patients. Those previously operated upon for ulcer by gastrectomy or gastro-enterostomy responded best to vagal resection. Patients with recurring painful duodenal ulcers and those with known peptic ulcers who had suffered from hæmatemesis on one or more occasions responded well. Nervy and psychiatric patients did not do well, but in other patients fasting gastric acidity and motility diminished and the ulcers healed without recurrence over a two-year period.

Bacitracin

F. L. MELENEY AND B. JOHNSON (*The Journal of the American Medical Association*, March 8, 1947) discuss treatment with an antibiotic named bacitracin, after the child Margaret Tracy, from whom the material was obtained. From a compound fractured tibia in this girl an aerobic Gram-positive spore-forming bacillus was obtained, which produced in ordinary culture media a powerful antibiotic agent with a wide spectrum of antibacterial activity. The crude filtrate was found to inhibit the growth of streptococci and to protect mice against hæmolytic streptococci. A concentrated solution of the filtrate was used locally in 100 cases of localized or localizing infections, such as boils, abscesses, infected wounds, ulcers, impetigo and the like. Streptococci, staphylococci, Gram-positive and Gram-negative rods were the predominating organisms. Favourable results were obtained in 88% of cases. These represented the general run of localized or localizing infections seen every day in consulting room or clinic.

Penicillin in Scarlet Fever.

H. L. HIRSCH, G. ROTMAN-KARKA, H. F. DOWLING AND L. K. SWEET (*The Journal of the American Medical Association*, March 8, 1947) describe the effects of penicillin in the treatment of scarlet fever. One hundred and sixteen patients were treated with penicillin, 10,000 units every three hours for an average of 5·4 days, that is, until the temperature had remained normal for twenty-four hours. The results were better with penicillin than with sulphonamide compounds, and as good as those with convalescent scarlet fever serum. Fewer complications followed the use of penicillin, but the three-hourly injections were a definite contraindication to this mode of treatment under present methods of administration.

Peripheral Vascular Sclerosis

G. DE TAKATS AND M. H. EVOY (*The Journal of the American Medical Association*, February 15, 1947) discuss sympathectomy for peripheral vascular sclerosis. Fifty-seven patients were sorted into four groups: symptomless patients with absence of pulsation in the vessels of the foot, those with claudication, those with rest pain, and those with ulceration or gangrene of digits. In nearly all cases improvement was observed after lumbar sympathectomy. Cerebral, cardiac or renal disease of severity excluded operation. The authors consider that diabetes, lipæmia and hypertension are important causative factors in peripheral vascular disease. A blood cholesterol level over 250 milligrammes *per centum* should be reduced if possible by diets with a high protein and low fat content, thyreoid extract and lipocaic or methionine. Intermittent pressure and occlusion of peripheral vessels by means of a machine was found to be useful treatment; this gave better results after sympathectomy. Rest in bed was also of the greatest value. Preliminary nerve block of the lumbar sympathetic was performed in these patients and operation followed if the nerve block was satisfactory. Sympathectomy improved the circulation and the warmth of the affected limb, and in the presence of severe pain or gangrene often enabled a lower level amputation to be performed. Intravenous injection of 1000 millilitres of a 2·5% solution of diethyl oxide (diethyl ether) for 24 treatments was suggested as a new form of therapy. Isotonic salt solution was the diluent.

Eclampsia.

F. E. WHITACRE, W. M. LOEB AND H. CHIN (*The Journal of the American Medical Association*, February 15, 1947) summarize their findings in 200 cases of eclampsia; 75% of the patients were *primiparæ*. Convulsions appeared before, during or after labour, 75% being prior to the onset. The mortality rate was 17% and the fœtal death rate 28%. Intramuscular injections of magnesium sulphate, barbiturates and intravenous

injections of hypertonic glucose solution were used. The pathological features of eclampsia included thrombi, areas of necrosis and hæmorrhages in the liver, and œdema of the brain with hæmorrhages. The kidneys were not constantly damaged. The authors state that the cause of eclampsia is unknown, but that vascular spasm is constant, and the cold pressor test applied to one arm gives an alarming rise of blood pressure in the other arm. The average blood urea nitrogen content in this group was 34 milligrammes and the average blood uric acid content 6·4 milligrammes *per centum*. Prophylaxis included omission of salt and limitation of fluids, if the body weight increased rapidly or the systolic blood pressure rose above 135 millimetres of mercury. Lessened urinary output was a danger sign. Any serious symptom necessitated the use of intramuscular injections of magnesium sulphate (25%), barbiturates, intravenous injection of 20% glucose solution (500 millilitres), *Veratrum Viride*, and lumbar puncture. Soluble phenobarbitone, 0·3 gramme intramuscularly, was used.

Congenital Paroxysmal Tachycardia.

J. A. GARVIN AND E. M. KLINE (*American Heart Journal*, March, 1947) report the recognition of paroxysmal tachycardia in a fœtus three months prior to its birth. The condition recurred after the birth of the child and was controlled by the oral administration of 30 milligrammes of quinidine sulphate at intervals of six hours. The parents were taught to recognize the paroxysms and to administer quinidine as necessary; none was necessary after the child was three and a half months old.

Pulmonary Sarcoidosis.

L. HENRY GARLAND (*Radiology*, April, 1947) states that the pulmonary changes in sarcoidosis are now recognized as constituting one of the most conspicuous manifestations of this bizarre and no longer rare disease. The thoracic radiological findings may be divided into those showing apparent involvement of the lungs alone, those indicative of lung and lymph node involvement, and those apparently indicating lymphadenopathy alone. The pattern of the lung involvement is extremely variable, ranging from true miliary densities, through coarse nodulation and apparent linear fibrosis to coalescent cirrhotic or pneumonic shadows, all with or without adenopathy. There is nothing characteristic in the findings in the individual case; however, the apparent excellent health of the person in contrast with the extensive X-ray shadows often warrants a surmise as to the nature of the latter. The miliary and nodular lesions are due to aggregations of sarcoids in the lung parenchyma. The linear lesions may be due to sarcoid lymphangitis, to lymphœdema, to congestion or, occasionally, to fibrotic changes. The intrathoracic lymph node enlargement tended to conform to a curious pattern in 13 of the 24 subjects showing adenopathy. The pattern was one in which there was simultaneous enlargement of hilar nodes and only the right upper mediastinal or paratracheal nodes. The most frequent type of sarcoidosis encountered clinically is one with hilar lymphadenopathy and pulmonary infiltration. An increasing number of such cases are being discovered in routine chest surveys and are being interpreted as tuberculosis, Hodgkin's disease, mediastinal tumour and other entities. It is desirable that the possibility of sarcoidosis be kept in mind in such instances and the attempt made to establish the correct diagnosis by microscopic examination. Sarcoidosis should be considered in the differential diagnosis of all cases of chronic painless lymphadenopathy, whether there are demonstrable lesions of the skin, bones and lungs or not. The diagnosis is not established by pathological examination alone, but only in conjunction with the appropriate clinical and bacteriological evidence to eliminate other granulomatous infections. A palpable lymph node or skin nodule is the most desirable tissue for microscopic examination. However, when none such is evident, exploration of the mesial end of the right supraclavicular fossa through a short incision will frequently yield an upper anterior mediastinal node for study and diagnosis. Absence of pulmonary involvement at one stage of sarcoidosis is no assurance that it will not be silently present months or years later. The course of a given case is usually quite unpredictable. The lesions may regress, remain stationary, or progress without apparent reason. This renders estimation of the beneficial effects of therapy, such as X-ray irradiation, extremely difficult.

Pulmonary Embolism Caused by Penicillin-Oil-Beeswax.

PHILIP K. BONDY, WALTER H. SHELDON AND H. STEPHEN WEENS (*The American Journal of Medicine*, July, 1947) report a case of severe pulmonary reaction following the accidental intravenous administration of penicillin in an oil-beeswax vehicle. Animal experiments indicated that the severity of the reaction was due to two factors: first, the viscosity of the oil-beeswax mixture, which caused it to block large branches of the pulmonary artery, and second, the severe inflammatory reaction elicited by the beeswax. Evidence suggested that the severity of the inflammation might be due to the chemical composition of the wax. The authors stress the importance of taking precautions to prevent the intravenous injection of oil-beeswax preparations. The danger involved is greater than with oil alone. If the accident is suspected the patient should be observed in hospital for at least three days before the possibility of a severe late reaction is discarded. For twenty-four hours after the accident the authors' patient gave no indication of the severity of the impending reaction. Thirty-six hours after the injection X-ray films showed extensive lung involvement. Recovery was more rapid clinically than radiologically, but was complete in twenty days.

Coccidioidomycosis.

H. W. JAMISON AND R. A. CARTER (*Radiology*, April, 1947) state that the diagnosis of coccidioidomycosis is not a difficult one if the physician is alert to the possibility of such a condition. The disease should be suspected in the case of any person recently returned from an endemic zone of infection, who presents the signs and symptoms of a respiratory infection. If a positive result to the coccidioidin test is obtained under these conditions, a presumptive diagnosis of coccidioidomycosis is warranted. A negative result rules out the disease in all but the most severe infections. The diagnosis is established with certainty by a positive result to the complement fixation or precipitin test or by recovery of the causative organism from the sputum by incubation or guinea-pig inoculation. In the acute pneumonic phase of the disease the radiological appearance is non-specific, and differentiation from primary atypical pneumonia, rheumatic pneumonitis, and other respiratory infections cannot ordinarily be made from the X-ray photographs alone. Residual "burned-out" nodular or cyst-like foci of coccidioidomycosis are quite characteristic in radiological appearance and are seldom confused with other conditions when occurring in endemic areas. Among diseases to be differentiated are primary tuberculosis, metastatic carcinoma, congenital cyst, adult tuberculosis, lung abscess, pyogenic and mycotic infections. The discrepancy between the clinical and radiological findings is often helpful in establishing the diagnosis. Cases in which mediastinal adenopathy is dominant are usually among the more severe and prolonged infections and give rise to most of the fatalities. Among the conditions to be considered in the differential diagnosis are Hodgkin's disease, pulmonary tuberculosis, sarcoidosis and bronchogenic carcinoma.

Chronic Liver Impairment.

J. G. MATEER, J. I. BALTY, H. A. STEELE, S. W. BROUWER AND J. R. COLVERT (*The Journal of the American Medical Association*, March 29, 1947) discuss chronic liver disease. Various liver tests are evaluated. The oral hippuric acid test is regarded as one of the less sensitive tests and the cephalin-cholesterol, sulphobromophthalein and thymol turbidity tests are regarded as more sensitive. A quantitative urinary urobilinogen test (Watson) is also regarded as reliable evidence of liver disorder, but errors in technique are noted. The authors describe a therapeutic test of liver therapy which involves administration of a diet with a high carbohydrate content (350 to 400 grammes), a high protein content (125 to 150 grammes), and a low fat content (35 grammes), with adequate intake of vitamins *B* and *A*.

Agranulocytosis.

SAMUEL FISHER, HOWARD L. HOLLEY AND GEORGE FEIN (*Archives of Dermatology and Syphilology*, January, 1947) report on eleven cases in which agranulocytosis followed intensive arsenotherapy for syphilis, and one case in which this complication occurred in the course of routine orthodox weekly injections of neoarsphenamine. Of the patients, 50% had received no previous therapy for syphilis. The reaction occurred in all cases towards the end of the scheduled course of treatment. Immediate cessation of the administration of arsenicals followed, and therapy with "Dimercaprol", "Pentnucleotide" and liver extract and, in the more severe cases, blood transfusions were instituted. There were no deaths. The cases reported emphasize the importance of a close survey of all patients receiving arsenicals, with particular observation of the temperature and with routine blood counts. In 50% of the cases the agranulocytosis occurred after there had been a febrile reaction of the "erythema of the ninth day type" or fever alone.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held in conjunction with the Alfred Hospital Clinical Society at the Alfred Hospital, Commercial Road, Prahran, on Wednesday, May 21, 1947. The meeting took the form of a series of clinical demonstrations by members of the medical staff of the Alfred Hospital and of the associated clinical society.

Total Assessment of Heart Disease.

To emphasize the value of total assessment of the patient in elucidating heart problems, DR. M. C. DAVIS discussed five cases illustrating the effect of (i) nutritional state and obesity (Cases I and II), (ii) the effect of endocrine imbalance (Case III), (iii) psychological aspects (Case IV), (iv) consideration of mechanical factors (Case V).

Case I was that of a patient, aged thirty-three years, who, six months earlier, had had all the symptoms of cardiac decompensation and weighed at that time twenty-one stone nine pounds. Treatment had consisted of rest in hospital, diuretic therapy and caloric control of diet. No thyreoid gland was used and the patient at the time of the meeting weighed thirteen stone five pounds—a loss of 117 pounds—and was practically free of symptoms. Her main disability, which incidentally she had been also getting before her weight reduction, was mild syncopal attacks, the result of a tremendous amount of loose abdominal tissue.

Case II was that of a patient, aged fifty-four years, who had previously been treated with digitalis and cardiac remedies. He had presented with gross cardiac dyspnœa, nocturnal asthma and some œdema. There had been no cardiac enlargement, and the cardiogram was satisfactory. He had been reduced in weight from seventeen stone nine pounds to fourteen stone nine pounds by diuretic therapy and rest. All cardiac remedies had been stopped; he had become symptom free.

Case III was one of long-standing cardiac decompensation with enlargement and precordial pain in a female aged fifty-six years. She had been found to have a basal metabolic rate of −28%, and had made a dramatic response to thyreoid therapy only.

Case IV was that of a female, aged fifty-six years, who had had gross aortic regurgitation, first recognized in 1937. There had been no change in the cardiac bruits or in the size of the heart. She, however, suffered from dyspnœa according to the state of sobriety of her husband. The dyspnœa had been as intense in 1937 as it was at the time of the meeting, and while conditions at home were normal she appeared to be virtually free of symptoms.

Case V was that of a male patient, aged forty-eight years, who had presented with precordial pain, which had been previously called angina, but which proved to be due to a very simple interlocking of the eighth and ninth ribs on the left side at their tips. It occurred only on certain exertion and simulated the anginal syndrome. All investigations gave otherwise normal results.

Dr. Davis showed a number of charts and models to indicate the value of the special investigations and their proper place in the estimation of heart problems.

Penicillin.

DR. ROBERT OFFICER with members of the staff of the Commonwealth Serum Laboratories arranged a demonstration dealing with the stages of manufacture, assay and methods of administration of penicillin.

Amicrobic Pyuria.

DR. R. S. LAWSON showed a patient, a male, aged forty-three years, who had first sought medical advice in September, 1946, for urethral discharge, which was revealed on examination of a smear to be due to a non-specific urethritis. This had cleared up after treatment with sulphapyridine, but a month later the patient developed acute cystitis with great frequency and urgency of micturition, the urine appearing dirty and blood stained. Microscopic examination of the urine revealed numerous pus cells and blood cells, but no organisms on direct examination or on attempted cultivation. The tubercle bacillus could not be identified on microscopic examination or after attempts at growth of a culture and a guinea-pig was injected with the object of discovering such an infection. Cystoscopic examination was unsatisfactory because of the very small capacity of the bladder, which bled excessively. Excretion pyelography revealed slight dilatation of the renal pelvis and ureter, but no other lesion. On the features of cystitis with gross amounts of blood and pus in the urine, but with no organisms (including tubercle bacilli) discoverable on microscopic examination or attempted growth of a culture from the urine, a diagnosis of "amicrobic pyuria" had been made. Three injections of neoarsphenamine, each of 0·45 gramme, were given intravenously at weekly intervals with relief within two days of the first injection, and the complete disappearance of symptoms. The urine became absolutely clear of all pathological elements after the third injection. The response to treatment was held to clinch the diagnosis and the patient had remained entirely free from signs and symptoms of renal disease since then—a matter of six months. Recent cystoscopic examination revealed a normal bladder, and excretion pyelography showed normal appearances. The results of Wassermann and gonococcal complement fixation tests of the blood were negative.

Varicose Ulcer and Varicose Eczema.

DR. RUSSELL HOWARD showed patients with varicose ulcer and varicose eczema. He emphasized that the basic element in the treatment of those conditions was ligation of the greater saphenous vein and its tributaries at the *fossa ovalis*, followed by retrograde injection. The anatomical variations in the tributary veins were discussed and the technical difficulties of the operation described. Dr. Howard said that he used 20% sodium chloride solution as the sclerosing agent, injecting 20 millilitres into the distal end of the ligated greater saphenous vein. The occurrence of ulcers in the drainage area of the small saphenous vein was mentioned. He felt that incompetence of the great saphenous vein was also usually present.

Carcinoma of the Prostate Treated with Stilbœstrol.

Dr. Lawson also showed two patients illustrating the response of carcinoma of the prostate to stilbœstrol treatment. The first patient, aged eighty-five years, had been under observation for two and a half years. He had first presented with retention of urine, and at that time gave a previous history of frequency of micturition of up to 20 times daily, and hourly during the night, for the preceding twelve months. He had also had hæmaturia occasionally. After relief of the retention by the use of a catheter, treatment had been commenced with stilbœstrol, five milligrammes daily. After three months the dosage was reduced to five milligrammes every second day and had continued at that level. No other treatment had been given. The patient had remained in good health, passing urine without difficulty or undue frequency five to six times daily and once or twice at night. The prostate, which had been hard, enlarged and nodular, was much reduced in size. X-ray examination revealed the presence of metastasis in the right pubic bone, which had remained stationary over the previous twelve months. Cystoscopic examination revealed a nodular bulging of the prostate to the right of the internal meatus of the urethra.

The second patient with carcinoma of the prostate was aged seventy-six years. He had first presented with retention of urine in May, 1946, but was, at the time of the meeting, passing urine without difficulty, solely as a result of treatment with stilbœstrol, as in the case of the previous patient.

Surgery of Trauma.

Dr. Lawson also showed a man, weighing nineteen stone, who, twelve months after excision of the patella for compound fracture, had almost full power of knee extension and no functional disability; a patient on whom secondary nerve suture of the radial and ulnar nerves had been performed, an illustration of progress after nerve suture and the use of the elastic traction splint; and a patient showing full functional recovery as a result of tendon suture after severance of six of the tendons on the radial side of the wrist joint.

Cor Pulmonale.

DR. J. E. SEWELL showed a man, aged forty years, with *cor pulmonale*. He had been in good health until, in January, 1941, when in England, he became seriously ill with bronchopneumonia. During convalescence he was dyspnœic and that symptom had increased gradually and progressively. Œdema of the feet had been first noticed in June, 1945, when he was in hospital. In July, 1946, he had had gross œdema of the legs, reaching above the knees, and the scrotum was involved. He was cyanosed, with difficulty in breathing, and clubbing of the fingers and toes was present to a minor extent. Physical signs of emphysema and con-

gestive enlargement of the liver below the costal margin, of three fingers' breadth, was noted at the time. He was not anæmic and the blood pressure was not raised. After diuretic treatment for three months the œdema had disappeared and he was able to walk slowly for a short distance without distress.

One month later œdema of the feet had reappeared, polycythæmia was detected, and early right axis deviation was demonstrated by means of the electrocardiograph. By December 19, 1946, the red blood count had reached 7,900,000 cells per cubic millimetre and the hæmoglobin value was estimated at 21·5 grammes *per centum*. By January 30, 1947, he was very emphysematous and the œdema had increased in spite of rest in bed, but it was relieved after a course of injections of "Neptal". On February 17, 1947, it was demonstrated radiographically that the cardiac silhouette was considerably enlarged, particularly to the right side. On April 22, 1947, it was noted that œdema was constantly present over the sacrum and the lower portion of the abdominal wall. The liver was tender and very congested, but the blood examination gave results within normal limits. At the time of the meeting good drainage had been obtained by acupuncture of the legs; the breathing was easier, though the patient felt very tired. He was having a completely salt-free diet, but his appetite was poor.

Amœbiasis.

Dr. Sewell also showed a male patient, aged thirty-one years, who was born in Parkville, Victoria, and, except for one period of six months spent in southern New South Wales, had always lived in Victoria. He had first come under observation when admitted to the Alfred Hospital on February 27, 1942, on account of intermittent lower abdominal pain and alternating constipation and diarrhœa during the previous six months. The presence of blood, mucus and pus had frequently been noted in the stools, his appetite had been poor and he had lost two and a half stone in weight. It was thought likely that he had carcinoma of the large bowel. After investigation he had been discharged from hospital on April 15, 1942. Ten days later he was readmitted, having lost another half-stone in weight and having suffered an acute exacerbation of ulcerative colitis. His condition had improved slowly on treatment, which included mixed antidysenteric serum by the intravenous route, Bargen's vaccine and instillation of silver nitrate solution into the bowel. Though he still had dysenteric stools he was allowed to go home at his own request on June 28, 1942.

The patient had been readmitted to hospital on August 15, 1943, and stated that he had had gratifying results by treating himself with courses of "Carbasone". For six weeks, however, he had had a recurrence of pain and anorexia and had lost approximately two stone in weight. The liver was enlarged and tender, and on August 24 a liver abscess was drained posteriorly, a cupful of material like anchovy sauce being obtained. Four days later vegetative amœbæ were discovered in the fæces and after a course of subcutaneous injections of one grain of emetine hydrochloride daily for ten days he had left the hospital, once again greatly improved in health.

Dr. Sewell went on to say that the patient had been readmitted to hospital on February 10, 1947, with a similar group of symptoms. He had been anorexic, with loss of weight and loss of strength for six months, and for one month had had a continual dull aching pain in the right hypochondrium and in the epigastrium. He was feverish, with leucocytosis and considerable enlargement and tenderness of the liver. A course of emetine had been again given and the temperature came down by the sixth day. Four days later, however, vegetative amœbæ had been found again in a specimen of fæces, and on March 14, 1947, he had been allowed to go home, feeling well.

Diaphragmatic Hernia.

The third patient shown by Dr. Sewell was a married woman, aged fifty-two years, who had first been seen in the out-patients' department at the Alfred Hospital on February 6, 1947. For six weeks she had suffered pain of a sharp, non-radiating, nagging nature behind the lower end of the sternum and high up in the epigastrium. The pain came on at almost every meal, after the first few mouthfuls of food, and lasted from two to ten minutes. She also had had a good deal of flatulence throughout the day. Her appetite was good and she had not lost weight, but was mildly obese. From the X-ray photographs the presence of a diaphragmatic hernia of the hiatus type had been demonstrated, the fundus of the stomach lying in the thorax. Although the benzidine test for occult blood in the fæces was positive, there was no other evidence of peptic ulceration or malignancy.

Dr. Sewell explained that the patient had been placed on a reduction diet and given a few gastronomic rules with reassurance. There had been considerable improvement and the occasional attacks of pain were quickly relieved by means of antacid powders.

(To be continued.)

NOTICE.

THE General Secretary of the Federal Council of the British Medical Association in Australia has announced that the following medical practitioners have been released from full-time duty with His Majesty's forces and have resumed civil practice as from the dates mentioned:

Dr. C. L. Gibbons, 5, Marsden Street, Boorowa (August, 1946).

Dr. Ian B. Jack, 336, Beamish Street, Campsie (October, 1946).

Post-Graduate Work.

BRITISH COUNCIL SCHOLARSHIPS FOR AUSTRALIANS.

FOR several years the British Council has awarded a number of scholarships annually for Australians to study in the United Kingdom. Six will be awarded in 1948-1949. The general conditions governing these scholarships remain much the same as before, but this year there will be greater scope for non-academic candidates: nurses, musicians, painters and so on.

British Council scholarships are normally for one academic year. They may be held at universities or other suitable institutions in the United Kingdom. The value of a full British Council scholarship is about £350 sterling, together with return fare.

Information and application forms may be obtained from the registrars of the universities or from the offices of the British Council at Canberra, A.C.T.; 489, Bourke Street, Melbourne; and 104, Hunter Street, Sydney. The completed applications of academic candidates should be addressed to the registrar of the university from which they graduated, and those of non-academic candidates to the representative of the British Council, Canberra, A.C.T. The closing date for completed applications is October 31, 1947.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

THE Post-Graduate Committee in Medicine in the University of Sydney announces the following courses and lectures.

Annual General Course.

Lectures: Professor R. W. Gerard, professor of physiology at the University of Chicago, who has been invited to Australia by the National University, will be in Sydney in November. Arrangements are being made for him to give two lectures during his stay in Sydney, the probable dates of which are Tuesday, November 4, and Tuesday, November 18, at 8 p.m., in the Stawell Hall, 145, Macquarie Street. A further announcement will be made shortly.

Film Programme: The following films will be shown on Wednesday, October 22, at 4.30 p.m., in the Stawell Hall: "Varicose Veins: Their Management by the Combined High Ligation and Injection Treatment", and "An Operation for Hydatid of the Liver".

Course for General Practitioners.

A course for general practitioners will begin on October 7 for eleven weeks and will be made up as follows: general and special sections, October 6 to 17; medicine, October 20 to 31; surgery, November 3 to 14; obstetrics, November 17 to 28; gynæcology, December 1 to 5; pædiatrics, December 8 to 19. Early application to attend the whole or portions of this course is essential.

Week-End Course at Newcastle.

The Post-Graduate Committee, in conjunction with the Central Northern Medical Association, will hold a week-end course in the nurses' lecture room of the Newcastle Hospital,

Pacific Street, Newcastle, on Saturday, October 25, and Sunday, October 26, 1947.

Saturday, October 25, 1947: 2 p.m., registration; 2.30 p.m., "Hypertension" (Dr. W. E. Fisher); 4 p.m., "Improved Obstetric Procedure" (Professor Bruce T. Mayes).

Sunday, October 26, 1947: 10 a.m., "Surgery in Hypertension" (Dr. I. Douglas Miller); 11.15 a.m., "Disorders of the Liver" (Dr. W. E. Fisher); 2 p.m., "Surgical Relief of Pain" (Dr. I. Douglas Miller); 3 p.m., "Views from Abroad" (Professor Bruce T. Mayes).

The fee for the course will be £1 1s., except for members of the defence forces, who may attend without fee. Those intending to be present are requested to notify Dr. E. J. Egan, honorary secretary, Central Northern Medical Association, 69, Hunter Street, Newcastle, as soon as possible.

Film Library.

During the last month the following films have been added to the film library: "Partial Resection of the Stomach (Gastrectomy) with Antecolic Termino-Lateral Gastro-jejunostomy", "The Use of Phthalylsulfathiazole in Chronic Ulcerative Colitis", "An Introduction to Clinical Neurology, Parts I, II, III and IV", "Symptoms in Schizophrenia", "The Treatment of Mental Disorders", "Coramine" and "Hygiene for Health".

A catalogue of films is available on application to the Secretary, The Post-Graduate Committee in Medicine, 131, Macquarie Street, Sydney. Application for the loan of medical films should be made no later than ten days before desired date of film showing.

THE MELBOURNE PERMANENT POST-GRADUATE COMMITTEE.

Course in Recent Advances in Genito-Urinary Diseases.

THE Melbourne Permanent Post-Graduate Committee announces that at 4.30 p.m. on Tuesday, October 21 and 28 and November 11 and 18, Dr. Henry Mortensen will conduct a course in recent advances in genito-urinary diseases, including genito-urinary infections and obstructions. The course will be held at the Medical Society Hall, 426, Albert Street, East Melbourne, and the fee is £2 2s. The course is approved under the Commonwealth Rehabilitation Training Scheme, and enrolments should be made as soon as possible with the secretary of the committee, College of Surgeons, Spring Street, Melbourne, C.1 (JM 1547-8).

Medical Matters in Parliament.

QUESTIONS IN THE HOUSE OF ASSEMBLY OF SOUTH AUSTRALIA.

ON August 27, 1947, in the House of Assembly of South Australia, the Honourable J. McInnes asked the following question:

> It has been brought under my notice by a member of the medical profession who is an honorary doctor at the Royal Adelaide Hospital that venereal disease is greatly on the increase. I understand that a number of persons with the disease refuse absolutely to take treatment in the prescribed form. It is stated that a list of the names of the persons concerned could be made available to any authority nominated by the Government. Is it the intention of the Government to introduce legislation amending the *Venereal Diseases Act* in order to provide for some form of compulsory treatment?

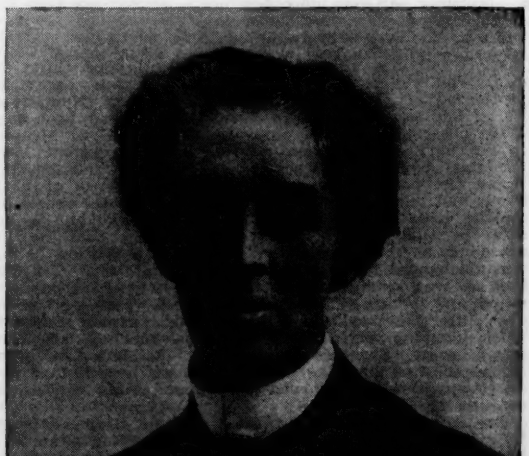
The Premier, the Honourable T. Playford, replied in the following terms:

> The Government has introduced legislation for this purpose on several occasions, but has had difficulty in getting it accepted by Parliament. As the hon. member will realize, there is always objection to compulsion, no matter how much it may be in the public interests. The Government has recently been negotiating with the B.M.A. and other authorities in order to submit a bill to Parliament this session, and I have no doubt that the difficulties experienced will be cleared up so that the legislation will be of such a nature that Parliament will accept it. I agree with what I believe are the hon. member's views, that it is necessary in the public interests that persons suffering from this disease should undergo the necessary curative treatment to ensure against their spreading the disease. The Government is fully seized of the position and will undoubtedly have legislation introduced this session in an endeavour to correct a very bad position.

Obituary.

LILIAN VIOLET COOPER.

DR. LILIAN VIOLET COOPER, whose death was announced recently in these pages, carried out her medical studies at the Medical School for Women and at the Royal Free Hospital, Gray's Inn Road, London. After taking conjoint diplomas at Edinburgh and Glasgow in 1890 she undertook a position as assistant to a doctor practising in a bleak town in Essex at the princely salary of thirty shillings a week. Her duties included anything from twenty to thirty visits



daily (on foot) round about the township and at the doctor's house afternoon and evening "surgeries", which were always crowded. Night calls frequently necessitated a walk of two or three miles over snow-covered ploughed fields. In confinement cases a nurse was seldom available to assist, and in those requiring operative attention Lilian Cooper would work single-handed while giving a neighbour directions how to administer the anæsthetic. The offer of an assistantship to a doctor in Brisbane, made through the late Mrs. Garrett Anderson, tempted her to come to Australia. The appointment proving unsatisfactory, she commenced an independent private practice after a few months, which she maintained with growing popularity for over fifty years. At first, owing to her sex, she met with opposition from some members of the medical profession and prejudice from the lay public; but her skill and devotion to the welfare of her patients won their way and gained for her a very large and exacting practice. She visited at intervals both America and England for post-graduate experience, working at the Mayo Clinic at Rochester and at the Johns Hopkins Hospital, and doing special gynæcological work in London. She took her M.D. degree at the University of Durham in 1912. In Brisbane she served as honorary surgeon on the staff of the first Mater Misericordiæ Hospital, established at North Quay in 1906, and at the present Mater Misericordiæ Hospital from 1911 until the first World War, when she joined the Scottish Women's

Hospitals for Foreign Service, serving in Macedonia as surgeon to the unit.

In 1924 she was elected honorary consultant surgeon to the Mater Misericordiæ Hospital. Other hospital appointments held by her during the course of her practice included one at the Lady Lamington Hospital for Women and another at the Children's Hospital. At the latter, during a period of shortage of doctors, she volunteered to undertake the resident medical officer's post and stayed at the hospital quarters, visiting her private patients from there. She retired from practice in 1941 and lived at her home, St. Mary's, Kangaroo Point, until her death in August of this year.

Congresses.

THE PAN-PACIFIC SURGICAL ASSOCIATION.

A LETTER has been received from Dr. F. J. Pinkerton, secretary-treasurer of the Pan-Pacific Surgical Association, announcing that the fourth congress of that body will be held at Honolulu from August 25 to September 8, 1948, with headquarters at the Royal Hawaiian Hotel. Further information may be obtained from Dr. Pinkerton, whose address is Young Building, Honolulu, Hawaii.

The Royal Australasian College of Surgeons.

THE ADMISSION OF EX-SERVICE GRADUATES TO FELLOWSHIP OF THE COLLEGE.

THE Council of the Royal Australasian College of Surgeons has decided that ex-service graduates who fulfil the following requirements and desire to obtain the Fellowship of the College may, on application on the prescribed form and with the approval of the Censor-in-Chief, present themselves for a special examination comparable with the type of examination adopted prior to the introduction of the new regulations in December, 1945.

Those eligible to avail themselves of this provision must (*a*) have held an approved higher surgical qualification involving a primary and final examination for a period of not less than five years, and (*b*) have been members of an active surgical unit during their service with the armed forces, and (*c*) have been prevented by active service conditions from undertaking the examination during the period of their war service.

The above provision will remain in operation until December 31, 1948—that is to say, examinations of this type will probably be held in December, 1947, June, 1948, and December, 1948.

Ex-service candidates who do not comply with the above requirements are referred to the last paragraph of regulation number 32 and are advised to communicate with the Censor-in-Chief. Regulation number 32 reads:

> All applicants for admission to the Final Examination shall be graduates of not less than five years of an approved medical school, university or college and, in addition, shall have—
>
> (*a*) completed the Primary Examination or been exempt therefrom by the Council;
> (*b*) undergone one year's training as a resident medical officer in an approved hospital;
> (*c*) completed a course of apprenticeship training, approved by the Censor-in-Chief, in general surgery or in one of the surgical specialties set out in regulation 33.
>
> All applicants for Fellowship in General Surgery shall have acted for a period to be determined by the Censor-in-Chief as an assistant to an approved surgeon or surgeons in the operating theatres and wards of an approved hospital, or have undergone a period of equivalent training to the satisfaction of the Censor-in-Chief.
>
> All applicants for Fellowship in approved specialties shall have, prior to the Final Examination, acted as an assistant to an approved general surgeon in the operating theatres and wards of an approved hospital for a period to be determined by the Censor-in-Chief, and shall also have acted as an assistant to an approved surgeon in that specialty for a period to be determined by the Censor-in-Chief.
>
> Any of the conditions contained in this regulation may be waived by the Censor-in-Chief, at his discretion, in the case of candidates who have returned from service with the armed forces.

It will be appreciated, however, that such candidates must, on receiving permission from the Censor-in-Chief, present themselves for the type of examination adopted in December, 1945, which involves a written and oral examination.

Those graduates who wish to avail themselves of these provisions should obtain immediately an official form of application from the Secretary of the College, Spring Street, Melbourne, complete it in detail and forward it to the Censor-in-Chief so that their qualifications may be considered.

Hospitals.

CENTENARY OF THE ROYAL MELBOURNE HOSPITAL.

As part of the celebrations to mark its centenary, the Royal Melbourne Hospital will hold a scientific session at the hospital from March 1 to 10, 1948.

Dr. William Evans, of Harley Street, London, who is attached to the cardiac department of the London Hospital, will visit Melbourne specially to lecture and give demonstrations during this session. The subjects of his three lectures will be heart sounds, heart murmurs and heart pain.

Through the cooperation of the Royal Australasian College of Surgeons, Sir Hugh Cairns, eminent neurosurgeon and Nuffield Professor of Surgery at Oxford University, who will be in Australia as Commonwealth Travelling Professor, will also lecture and give demonstrations. Leading physicians, surgeons and specialists on the staff of the hospital and university professors will take part in the scientific session, which will be divided into three periods—morning, afternoon and night.

The committee of management and the medical staff of the hospital issue a hearty invitation to medical men and women throughout Australia, particularly graduates of the hospital, to be present at the scientific session, a complete programme for which will be available shortly. It is also hoped that visitors may come from New Zealand and the East.

In conjunction with the scientific session a medical trades exhibition will be held at the hospital.

Australian Medical Board Proceedings.

TASMANIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Act*, 1918, of Tasmania, as duly qualified medical practitioners:

Friend, Kenneth James, M.B., B.S., 1938 (Univ. Sydney), Dip.Rad., 1947 (Sydney), Royal Hobart Hospital, Hobart.
Hudson, Rodney James, M.B., 1940, B.S., 1944 (Univ. Sydney), Hobart.
Bower, Herbert Michael, M.B., B.S., 1947 (Univ. Melbourne, Launceston General Hospital, Launceston.
Semens, Kelman, M.B., B.S., 1947 (Univ. Melbourne), Launceston General Hospital, Launceston.
Oliver, Brian Houston, M.B., B.S., 1947 (Univ. Melbourne), Launceston General Hospital, Launceston.

QUEENSLAND.

THE undermentioned have been registered, pursuant to the provisions of *The Medical Acts*, 1939 *to* 1946, of Queensland, as duly qualified medical practitioners:

Bruce-Smith, Bruce, M.B., B.S., 1944 (Univ. Sydney), 134, Margaret Street, Toowoomba.
Sawers, Ronald John, M.B., B.S., 1942 (Univ. Adelaide), Brisbane General Hospital, Brisbane.
Lake, Max Emory, M.B., B.S., 1946 (Univ. Sydney), Brisbane General Hospital, Brisbane.

Wootten, Frederick Ismay, M.B. B.S., 1939 (Univ. Sydney), District Hospital, Dalby.

Little, John Hamilton, M.B., B.S., 1945 (Univ. Melbourne), Commonwealth Health Laboratory, Townsville.

Withers, Robert Melville, M.B., B.S., 1946 (Univ. Melbourne), General Hospital, Cairns.

Hawker, Ross Wilson, M.B., B.S., 1945 (Univ. Sydney), Commonwealth Health Department, Anzac Square, Brisbane.

Storey, Joan Evelyn, M.B., B.S., 1944 (Univ. Sydney), care of Dr. U. Skyring, Rockhampton.

Godden, Ruth Irene, M.B., 1946 (Univ. Sydney), Base Hospital, Maryborough.

Golden, Albert Anthony Patrick, M.B., B.S., 1944 (Univ. Sydney), 13, Heydon Street, Mosman, New South Wales.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Byrne, Kevin Edward Geoffrey, provisional registration, 1947 (Univ. Sydney), Lakemba Cottage, Boulevarde, Lakemba.

Mutton, Montague Vernon, M.B., B.S., 1940 (Univ. Sydney), 556, Military Road, Mosman.

Gough, Roy James, M.B., B.S., 1944 (Univ. Melbourne), Henty, New South Wales.

Grun, Ernest, provisional registration, 1947 (Univ. Sydney), 48, New South Head Road, Edgecliff.

Allison, Robert William, provisional registration, 1947 (Univ. Sydney), Marrickville District Hospital, Marrickville.

Medical Appointments.

Dr. R. H. Ruprecht has been appointed medical officer of health to the Plantagenet Road Board (Mount Barker), Western Australia.

Dr. Alan James Clarkson has been appointed deputy quarantine officer at Port Lincoln, South Australia, under the provisions of the *Quarantine Act*, 1908-1947.

Dr. P. R. Patrick has been appointed a member of the Board of Optical Registration, in pursuance of the provisions of *The Opticians Acts*, 1917 to 1946, of Queensland.

Dr. Naomi R. Ryan has been appointed medical inspector of schools, South Australia.

Dr. P. B. Hagen has been appointed medical officer, Department of Public Health, New South Wales.

Dr. T. W. Hill has been appointed medical officer of health, Esperance Road Board, Western Australia.

Dr. N. C. Wright has been appointed senior medical officer, Department of Health, New South Wales.

Dr. J. P. Major and Dr. Doris L. Officer have been appointed members of the Queen's Memorial Infectious Diseases Hospital Board, Victoria.

Books Received.

"A Contribution to the Knowledge of the Influences of Gonadotropic and Sex Hormones on the Gonads of Rats (Monographs on the Progress of Research in Holland during the War)", by J. H. Gaarenstroom and S. E. de Jongh; 1946. New York and Amsterdam: Elsevier Publishing Company, Incorporated; London: Cleaver-Hume Press, Limited. 8" x 5½", pp. 180, with illustrations. Price: 16s.

"Recent Advances in Public Health", by J. L. Burn, M.D., D.Hy., D.P.H.; 1947. London: J. and A. Churchill, Limited. 8½" x 5½", pp. 418, with many illustrations. Price: 25s.

"Biochemistry for Medical Students", by William Veale Thorpe, M.A. (Cantab.), Ph.D. (London); Fourth Edition; 1947. London: J. and A. Churchill, Limited. 8" x 5½", pp. 504. Price: 18s.

"New Ways of Treating Uræmia: The Artificial Kidney, Peritoneal Lavage, Intestinal Lavage", by W. J. Kolff, M.D., with the cooperation of J. Van Noordwijk, P. S. M. Kop, N. K. M. De Leeuw and A. M. Joekes; 1947. London: J. and A. Churchill, Limited. 9½" x 6½", pp. 112, with many illustrations. Price: 10s. 6d.

"Modern Development of Chemotherapy (Monographs on the Progress of Research in Holland during the War)", by E. Havinga, H. W. Julius, H. Veldstra and K. C. Winkler; 1946. New York and Amsterdam: Elsevier Publishing Company, Incorporated. London: Cleaver-Hume Press, Limited. 8" x 5½", pp. 190. Price: 15s.

"The Child from Five to Ten", by Arnold Gesell, M.D., and Frances L. Ilg, M.D., in collaboration with Louise Bates Ames, Ph.D., and Glenna E. Bullis; Second Edition; 1946. London: Hamish Hamilton, Limited. 9½" x 6½", pp. 498. Price: 18s.

Diary for the Month.

OCT. 13.—Victorian Branch, B.M.A.: Finance Meeting.
OCT. 14.—Tasmanian Branch, B.M.A.: Ordinary Meeting.
OCT. 14.—New South Wales Branch, B.M.A.: Executive and Finance Committee. Organization and Science Committee.
OCT. 15.—Western Australian Branch, B.M.A.: General Meeting.
OCT. 16.—Victorian Branch, B.M.A.: Executive Meeting.
OCT. 21.—New South Wales Branch, B.M.A.: Medical Politics Committee.
OCT. 22.—Victorian Branch, B.M.A.: Council Meeting.
OCT. 23.—New South Wales Branch, B.M.A.: Clinical Meeting.
OCT. 24.—Queensland Branch, B.M.A.: Council Meeting.
OCT. 28.—New South Wales Branch, B.M.A.: Ethics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute; Brisbane City Council (Medical Officer of Health). Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

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